THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXV. No. 1921.] LONDON, MARCH 6, 1900. [52ND YEAR. PRICE 6d.

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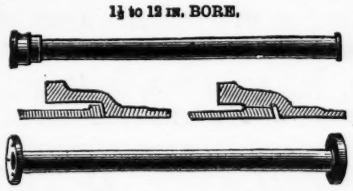

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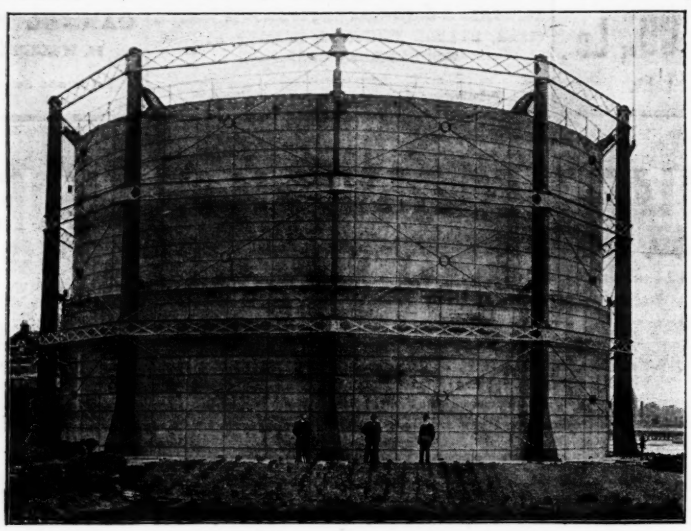

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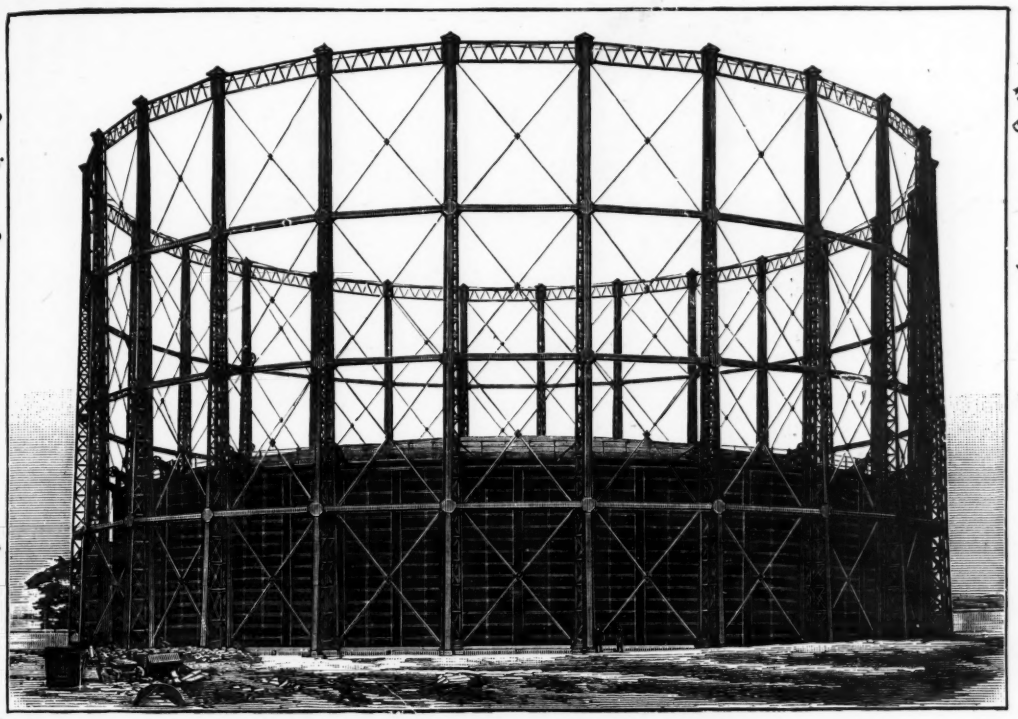

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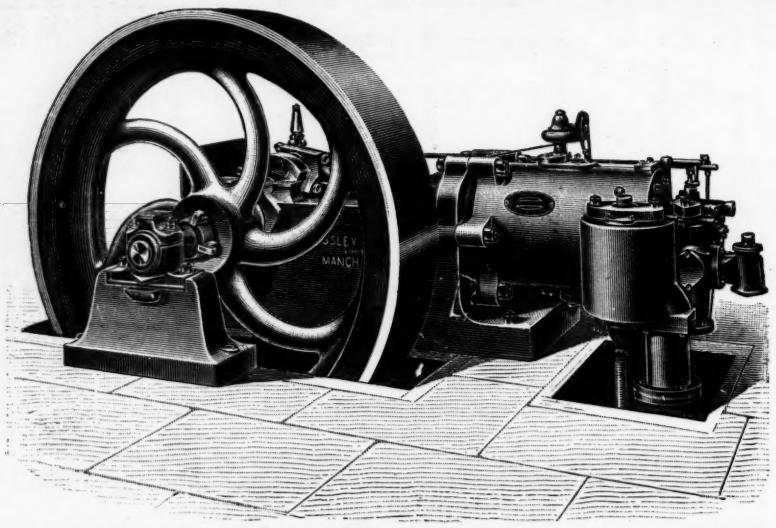

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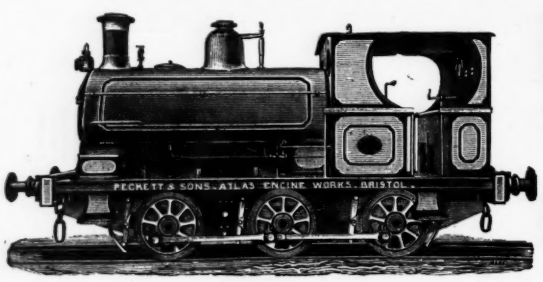

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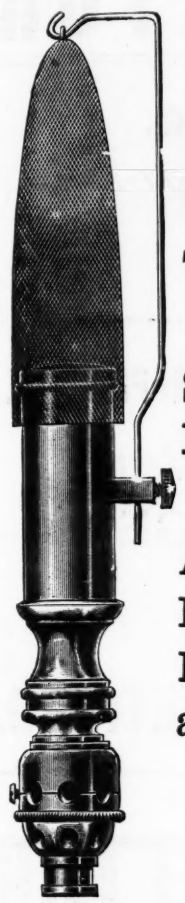

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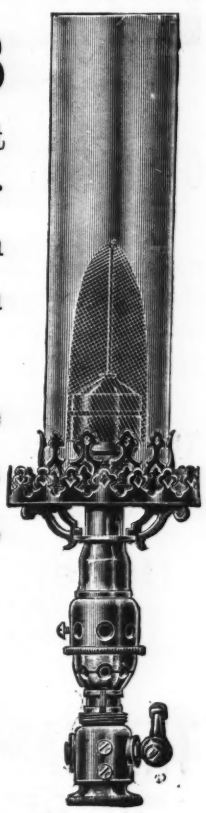

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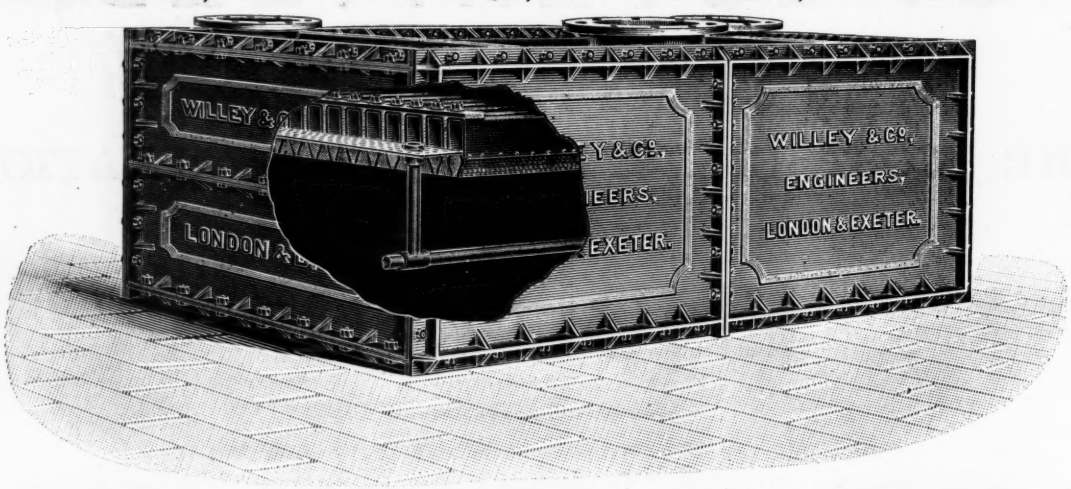

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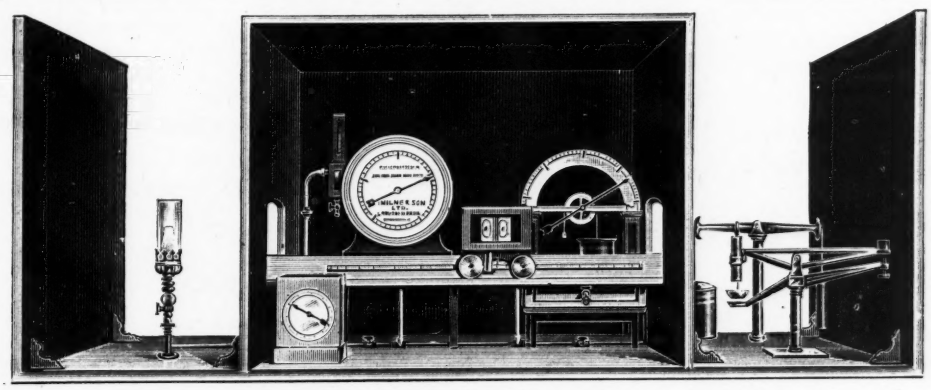

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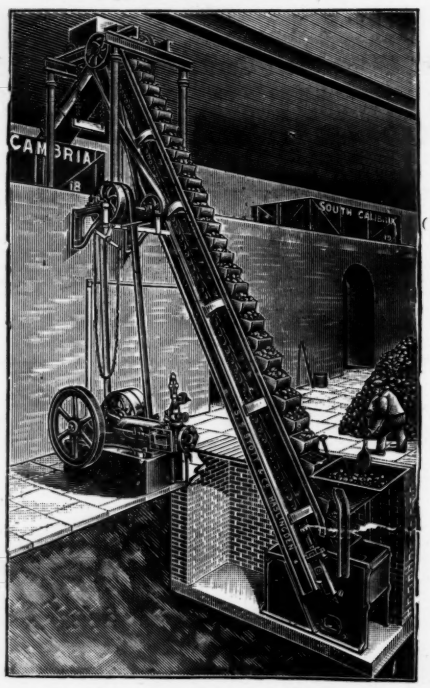

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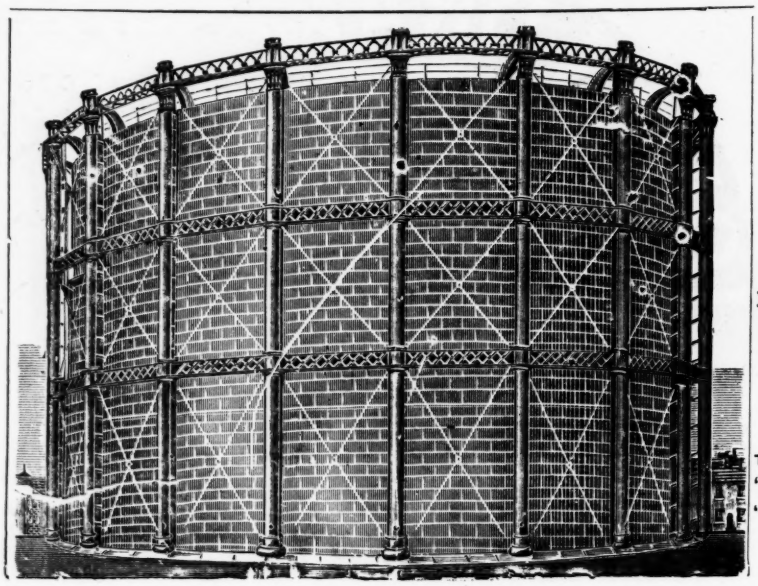

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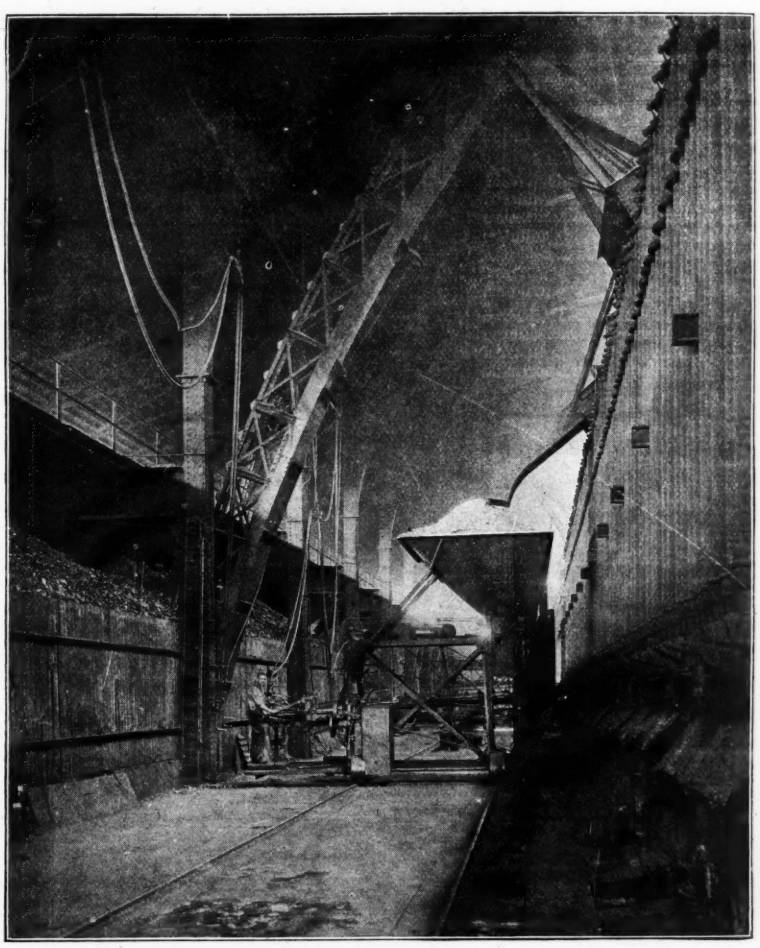

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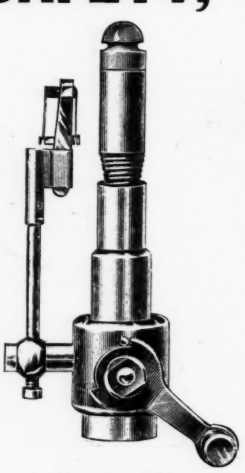

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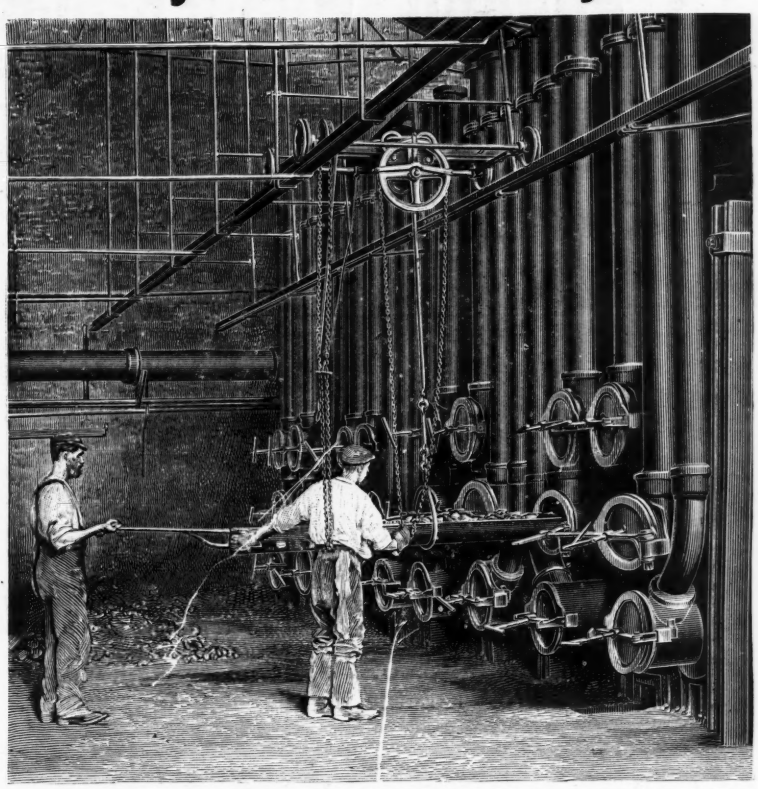

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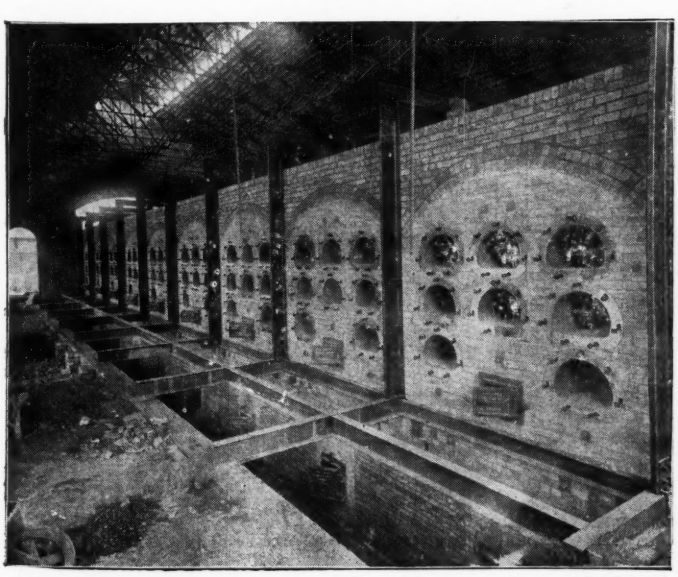

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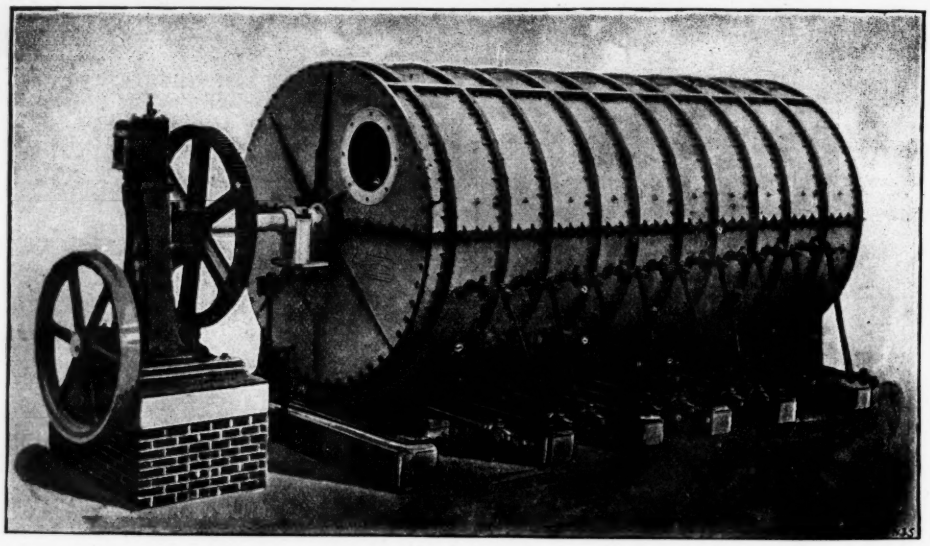

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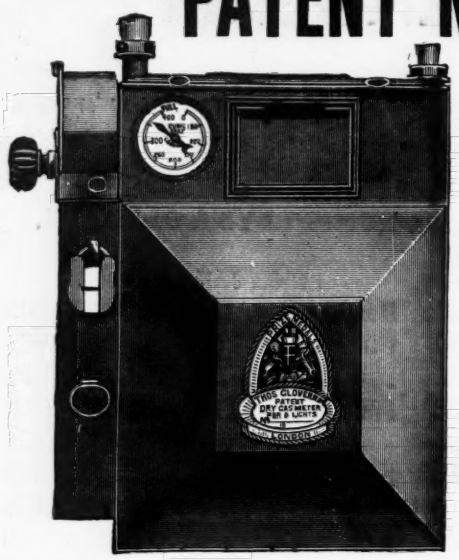

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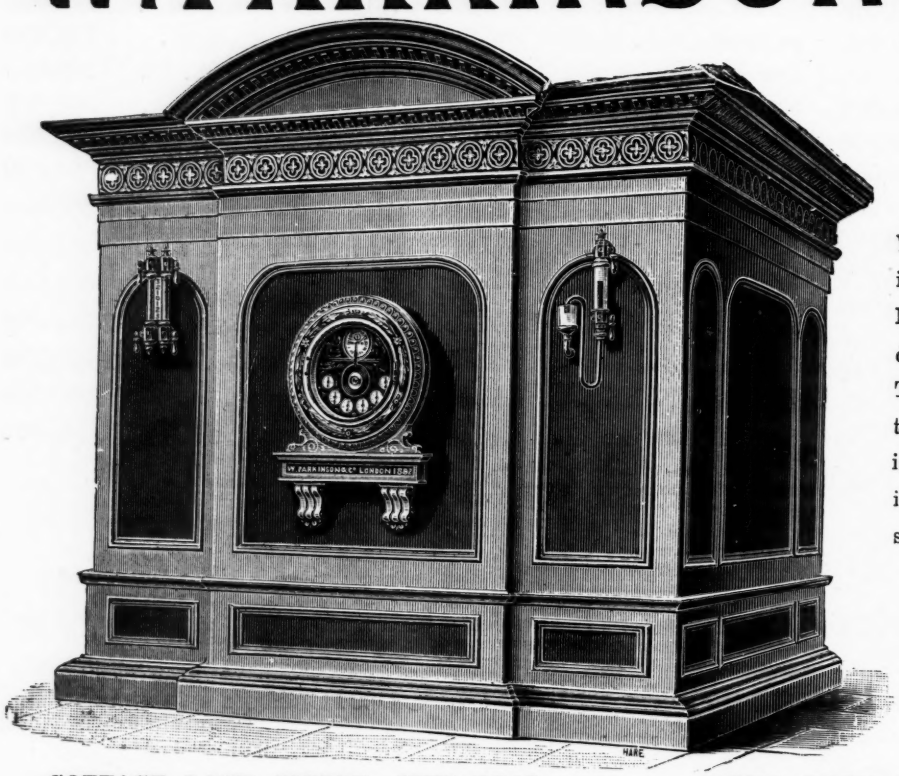

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CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE.
London Gas Questions in Parliament . . . 593
Questions Affecting the Coal Difficulty . . . 594
The Spontaneous Combustion of Coal; and High-Pressure Gas Distribution . . . 594
The Meeting of the Midland Association . . . 595
Official Trade Union Performances of the Week . . . 595
Private Members' Futilities . . . 595
The Eight Hours for Miners Bill . . . 596
WATER AND SANITARY AFFAIRS—
The London County Council and the Metropolitan Water Question 596
The Local Government Board and Typhoid Fever Epidemics . . 596
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market . . . 597
Electric Lighting Memoranda . . . 597
Concerning the Science and Art of Public Street Lighting . . . 598
The Labour Market in 1899 . . . 599
A Veteran Scottish Gas Manager . . . 599
Recent Publications—"A Short History of the Progress of Scientific Chemistry in Our Own Times;" "The Municipal Year Book for 1900" . . . 599
NOTES:—
Draughts in Houses . . . 600
Testing Portland Cement for Soundness . . . 601
Compressed Air Power Transmission . . . 601
Coke Breeze for Fire Resisting . . . 601
TECHNICAL RECORD:—
Midland Association of Gas Managers—Annual Meeting at Birmingham—
General Business . . . 601
The Late Mr. J. Fryer . . . 601
Inaugural Address by Mr. J. Ferguson Bell . . . 602
Discussion on Retort Heating . . . 606
The Inclined Retorts at Smethwick . . . 608
Southern District Association of Gas Engineers and Managers—Annual Meeting in London—
General Business . . . 609
Inaugural Address by Mr. D. Irving . . . 610
REGISTER OF PATENTS:—
Manufacture of Water Gas—Boult, A. J. (Fleischer, E.) . . . 613
Prepayment Meters—Green, H. . . . 613
Gas-Stove with Water-Heater—Richmond, E. W. T. . . . 614
Prepayment Gas-Meters—Pinchbeck, J. . . . 614
Regenerative Furnaces—Drake, J. A. . . . 615
Coin-Freed Gas-Meters—Pearce, G. W., and Whitbread, S. J. . . . 615
Self-Lighting Gas-Burners—Kent, H. A. . . . 616
Pressure-Regulator or Stop-Valve—Tobler, A. . . . 616
Regenerative Furnaces for Gas-Retorts—Brearley, J. H. . . . 616
Washing Gas—Guillaume, N. A. . . . 617
Patent Notices . . . 617
PARLIAMENTARY INTELLIGENCE:—
House of Lords—Progress of Bills . . . 618
House of Commons—Second Reading of the Gaslight and Coke Company Bill; Notices of Instructions relative to the Gaslight and Coke and South Metropolitan Gas Companies' Bills; Progress of Bills . . . 618
LEGAL INTELLIGENCE:—
High Court of Justice—Chancery Division—The Welsbach Incandescent Gas-Light Company, Limited, *v.* The New Sunlight Incandescent Company, Limited . . . 618
The Incandescent Gas-Light Litigation . . . 618
Conviction for Assault on Welsbach Company's Inspectors . . . 619
The Charge of Falsifying Books and Embezzlement . . . 619
The Payment of Water-Rates for Small House Property . . . 619
MISCELLANEOUS:—
South London Local Authorities and the South Metropolitan Gas Bill—Conference at Camberwell . . . 619
Acquisition of the Portland Gas-Works by the District Council—A Transfer Effected without Arbitration . . . 620
Belfast Corporation Gas Affairs—How a Loan to the Electric Lighting Committee is being Dealt With; The Price of Coke . 621
Darlington Corporation Gas Supply—Increased Storage Required 621
Longton Corporation Gas Supply—The Half-Year's Working; The Coal Supply Difficulty . . . 621
The Rothwell District Council and the Gas-Works—Local Government Board Inquiry . . . 621
Meeting of the South Shields Gas Company . . . 622
North Middlesex Gas Company . . . 622
Provincial Gas and Water Companies . . . 622
Gas and Water Companies' Stock and Share List . . . 625
Electric Lighting Notes . . . 626
Lincoln Corporation Water Supply—Proposed Boring at Boultham 627
Notes from Scotland . . . 628
Current Sales of Gas Products . . . 631
Coal Trade Reports . . . 631
PARAGRAPHS:—
PERSONAL: Mr. Harold S. Williams; Mr. Frank Morris; Mr. T. May, Assoc.M.Inst.C.E.; Mr. E. P. Reilly; Mr. Arthur Easton. 600
OBITUARY: Ex-Bailie Gow; Mr. John M'Landsborough; Mr. Peter Schuyler Bruff; Mr. David Stiven . . . 600
Oil for Removing Boiler Incrustation . . . 598
The Chemical Industry of Japan—Germany and the Metric System 613
Increased Consumption after Reduction in Price . . . 619
Installation of Inclined Retorts and De Brouwer Plant at Wakefield 621
Compensation to an Injured Workman of the Manchester Gas Department—Sales of Shares—New Joint-Stock Companies—Carburetted Water-Gas Plant for the Oldbury Gas-Works—Increases in Price—Harrow and Stanmore Gas Company—The Sunlight Company and the Chimneyless Burner Patent—The Hemel Hempstead Corporation and the Water-Works—Cagliari Gas and Water Company, Limited . . . 632
Lancaster Gas and Water Supply—Manchester Water Supply—The "Builder" on London Gas—Destruction of the Grand Theatre, Islington, through a Gas Explosion . . . 633

TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

London Gas Questions in Parliament.

LONDON Gas Affairs have been to the fore in Parliament and on the platform during the past week. On the motion for the second reading of the Gaslight and Coke Company's Bill in the House of Commons last Tuesday, Mr. Pickersgill moved as an amendment that the Bill be read a second time that day six months. The amendment was seconded by Mr. Lough; but, after a brief debate, it was rejected, and the second reading carried by a majority of 78. It would have been outrageous for the House to have refused the second reading of a Private Bill which was not only perfectly in order, but also proposed to take powers that a Committee of the House agreed last session were such as ought to be given to the promoters in order that the Company's lawful business might be properly carried on. So much of the merits of the Company's Bill was before the House; and the committal of the Bill was clearly right and expedient. There, however, the strength of the promoters' position comes to an end. The greatest enemies of the Company's cause have been those of their own household. Not all the Pickersgills and Loughs, who—as Mr. Boulnois truly remarked—would not, in their insensate Progressivism, let Londoners have either gas or water by the practical ways open to such supplies, could to any purpose stand in the path of the Gaslight and Coke Company if the unfortunate counsels of the Horseferry Road did not paralyze the friends of private enterprise. It was no part of the Company's duty to voluntarily offer to embody the recommendations of the Powers of Charge Committee in their own Bill; but neither was it politic for the Horseferry Road to flout the Committees of Parliament as it has done. Parliament and the public appear to be firmly persuaded that the dear gas supply which the Horseferry Road magnates affect to regard as part of the scheme of things, is chiefly due to their mismanagement of the business, and especially to extravagant capital outlay. Ordinary people know that if a retail shopkeeper cannot sell his goods as cheaply as the man in the same line over the way, bankruptcy is his portion. There is, therefore, on the part of a good many people who do not own a single gas share and never drew a directorial fee in their lives, a feeling of impatience of all special legislation which tends to protect the proprietors of a commercially unsuccessful undertaking—as measured by the standard of competition—from the consequences which would assuredly overtake them in the open. That is the public opinion which the Gaslight and Coke Company have to reckon with; and those who pretend to believe that Parliament will willingly pass fresh Acts for the perpetuation of such an unnatural state of things as the public complain of in this connection, are living in a Fool's Paradise. The favour of the modern commercial world is given to the Liptons, the Coppens, the Whiteleys, whose prosperity is based upon what the old-fashioned tradespeople used to call "underselling." There is no mercy on this earth for a trader who cannot do business at dead low-level prices.

Notice of motion has been given for "Instructions" to the Committee on the Gaslight and Coke Company's Bill, to introduce into the Bill clauses embodying the recommendations of the Powers of Charge Committee. It is difficult for outsiders to divine the counsels of the authorities of the House in regard to particular examples of the modern fashion of instructing Private Bill Committees. But it would not be surprising to see these "Instructions" ruled out as too sweeping, or as being otherwise inadmissible. The Speaker is not disposed to allow the discretion of Committees of the House to be fettered without sound cause. Somewhat similar "Instructions" are put down for the South Metropolitan Bill Committee; and it will be interesting to follow the way in which the House disposes of this complicated business.

Meanwhile, the South London Local Authorities have been conferring upon the South Metropolitan Bill. The proceedings, which are reported in another column, are not without an element of amusement. Counsel's opinion had been taken on the proposals of the Bill, and proved to be favourable to them generally; but he seemed to be just a little fogged over the proposed sliding-scale of illuminating power. He appeared to be under the impression that the Company might supply gas of different illuminating power in different districts; but apart from this he could not find

any fault with the Bill. Several of the delegates to the Conference were rather hazy about the same point; but one gentleman at least displayed a competent grasp of the subject, and warmly supported the scheme. Indeed, he was found so well posted on the points, that his possession of so much information made him "suspect." It was considered almost "uncanny" that a Vestry delegate should know so well what he was talking about—always supposing that he had not been primed by the Company. The speaker, however, was able to say that he had never spoken to Mr. Livesey in his life; but he held up a number of the "JOURNAL," saying: "This is where I get my "information. I have studied this paper for years." It is a testimonial which we greatly appreciate. A motion was made that Mr. Livesey should be invited to attend an adjourned meeting of the Conference for the purpose of explaining the Bill; and the suggestion was not a baseless one, in view of the misunderstanding we have already mentioned. It created alarm in some of the Vestrymen, however; because, as one of them candidly stated, they were afraid that Mr. Livesey would be able to talk them into anything. Very naturally, they agreed to formally oppose the Bill in Parliament; but, from what has transpired, the opposition will not be very venomous.

Questions Affecting the Coal Difficulty.

ON Wednesday last in the House of Commons a second reading was refused, by 199 votes to 175, to that hardy annual, the Bill to restrict the hours of labour in mines to eight per day from bank to bank. The majority against the Bill would, we think, have been considerably greater had members not felt so sure that it had no chance of becoming law. The temptation to the representative of a working-class constituency to play to the gallery by voting for a measure of which he does not approve, because he is confident it will be rejected, is as obvious as is the inducement to introduce Bills for the achievement of impossibilities, which are destined, as they are intended, to find their way into the parliamentary waste-paper basket. The Mines (Eight Hours) Bill was introduced by Mr. Herbert Lewis, who, however, entirely failed to make out the "strong and overwhelming case" which, as Mr. Thomas Burt justly observed, must be presented in favour of any suggested interference by Parliament with the conditions under which any industry may be conducted. No arguments were, in fact, adduced in favour of compulsorily restricting the hours of labour in coal mines which would not apply with equal force (if such be the word to use in respect of that which is essentially weak) to the vast majority of other industries. It was, instead, shown clearly by the speakers against the Bill that considerable injustice would be done, as between one district and another, by the proposed legislation, in consequence of the distance of the coal-seams from the bank varying so greatly in different mines.

As we have said, no proof was forthcoming that the miners are in need of special protection from the tyranny of their employers; nor, indeed, was it shown that the miners of the country are insistent in their demand for the State regulation of their hours of labour. On the contrary, many of them, and particularly the miners of Northumberland and Durham, are strongly opposed thereto. It was, in fact, a remarkable and eloquent circumstance that, of the three principal speeches made against the Bill, two were delivered by representatives of mining constituencies, both of whom had at one time been actually engaged in the work of coal mining—Mr. John Wilson and Mr. Thomas Burt. The truth of the matter is that the demand for the State limitation of miners' working hours does not come from the miners themselves, but from politicians and Labour "leaders" with axes of their own to grind. If the miners really wanted to have, and meant to get, their hours restricted to "eight from bank to bank," they would have obtained it long ago—as, in fact, not a few of them have. As Mr. Wilson said, wherever negotiation has been fairly tried, the eight-hour day has been already obtained.

A more inopportune moment at which to introduce a measure the effect of which would of a certainty be to diminish the output of coal in this country, could scarcely have been found. The more one examines the present situation of affairs in the coal trade in particular and in the industrial world in general, the more certain is the conviction that a speedy return of the coal market to its normal condition is not to be hoped for. By the "normal "condition" of the coal market we mean a state of practical equilibrium between supply and demand, with the concomitant maintenance of prices at the level at which they yield only a moderate return upon the capital employed in the production of the coal. The approach of spring will, of course, see the price of house coal tumbling down from the unjustifiably high figure it has reached; and the general public will doubtless think that all the trouble is over. But it must never be forgotten that the real scarcity all the way through has not been to any extent in "household," but in the qualities of coal used for industrial purposes; and the future of the market for steam and gas coals depends upon the state of trade at home and abroad, and the relationship subsisting between the output and the demand in other countries as well as our own.

As to trade at home, no signs of any real check in its activity are discernible. The war is affecting certain industries adversely—more especially those dependent upon the patronage of the leisured and moneyed classes. But it is bringing very full work to many others; and the effect on the commercial world of the increased taxation involved (as to which more will be known when this week's "JOURNAL" is in our readers' hands) will not be felt for some time to come. Most of the iron and steel manufacturers now have their hands full; and if any slackening of orders is experienced by some, we believe it is due to the reluctance of buyers to come in at present prices; and the least weakening in the market will precipitate their orders. It is significant that the Admiralty themselves state that they are only refraining from putting more ships on the Estimates on account of the difficulty in getting the necessary armour, machinery, guns, &c., turned out by the contractors. Trade abroad—more particularly in Germany, Russia, and France—appears also to be flourishing; railway enterprise and increasing armaments playing a great part in its stimulation. With the question of how far these countries can supply their own coal requirements, and to what extent they are dependent upon our own mines for their supplies, we must deal some other time, and merely say that, whether we look at home or on the Continent, we can see no sign of any immediate slackening in the demand for coal. It is significant of a general agreement with this conclusion that very large contracts have already been entered into for supplies during the current year, at prices practically equal to those at present ruling.

The Spontaneous Combustion of Coal; and High-Pressure Gas Distribution.

THE members of the Southern District Gas Managers' Association met in London on Thursday last, under the presidency of Mr. D. Irving, of Bristol, whose Inaugural Address will be found duly reported elsewhere. Mr. Irving devoted the greater part of his address to a thoughtful and practical examination of the phenomena of the spontaneous combustion of coal; and his observations on this subject, although not conclusive, will be read with interest by gas managers at home and abroad. The spontaneous combustion of coal in bulk is one of those troublesome matters which cannot be dealt with along hard-and-fast lines, but is continually making the wisdom of men look foolish. Mr. Irving is exceptionally well situated for studying the subject, for the reason that much of the coal raised in the neighbourhood of Bristol is notoriously liable to take fire in store. And when it once gets well alight, nothing will put it out. A heap of coal out of doors may be turned over with shovels half-a-dozen times; but if it means to burn, it will go on doing so while half a hundredweight of it remains. Professor Lewes has sufficiently accounted for the phenomenon, which is nothing more nor less than a rapid oxidation of the small coal. Big, clean lumps do not take fire in this way. What puzzles the plain man is that there should be enough air inside heaped small coal to act as it does. The spontaneous ignition of greasy cotton waste or damp hay can be more easily understood. What proportion of air, however, can there be in small coal? To the best of our knowledge, this has never been determined by experiment. After all, the explanation does not really explain anything. At best, it can only be of use as a warning. Small coal, perfectly dry, does not burn spontaneously. Damped, it may, and probably will, do so if it has much good in it, and is not merely road

sweepings. When we have said this, we have said all that is really known about the matter.

It is rather a pity that Mr. Irving did not allow himself the time to deal with the subject of gas distribution under high pressure, which is undoubtedly one of the gas engineering questions of the future. It is purely a matter of accident and routine that illuminating gas is handled and distributed in our towns under pressures measured by tenths of inches of water. There is no reason at all in the nature of things why the main pressures should not be in pounds above the atmosphere. Every railway train that leaves a station after nightfall, and many others, carries gas at a pressure measured by atmospheres. In America, natural gas has for years been distributed at pressures of 100 lbs. per square inch and upwards, without any difficulty or danger. American steam and compressed-air power distribution is done every day at pressures that would make some of our fossilized engineers fairly shudder with reflecting on what "might happen" if anything were to go wrong! Common coal gas is perfectly stable at pressures far higher than anything yet contemplated by rational engineers, who nevertheless perceive that gas transmission and distributing plant will have to be very much harder worked in the near future than ever it has been in the past, if the public are to be served, room for pipes found in the streets, and capital economized.

The Meeting of the Midland Association.

THE Midland Association of Gas Managers met in Birmingham last Thursday under the presidency of Mr. J. Ferguson Bell, of Stafford. There was a good attendance of members; and the proceedings were of an interesting character. The President's Address was of the high quality to be expected of the author. Mr. Bell heartily supported the proposal to unify the technical organizations of the gas industry. A very noteworthy passage of his address disclosed the fact that the Corporation of Stafford have become the pioneers of profit-sharing for the workpeople of their gas and electricity departments. Further information respecting this movement, hitherto held to be beyond the grasp of municipal undertakers, will be awaited with curiosity. Mr. Bell had a good word to say for the Workmen's Compensation Act. He dealt very lucidly and informingly with several of the chemical questions of gas manufacture, and ranged himself with those who hold that high candle power for gas is no security at all for the satisfaction of the public with the service. Altogether, Mr. Bell's address bore the imprint throughout of a keen and original mind; and it is on this account very good reading. The remainder of the business of the meeting consisted of an animated discussion of Mr. G. Helps's paper (read at the previous meeting) on the heating of gas-retorts; and an acknowledgment, rather than a discussion, of Mr. B. W. Smith's paper on the inclined retorts at Smethwick—also reserved from the previous meeting. Mr. Smith has every reason to be pleased with the warmth of the testimony given by his colleagues of the Midland Association to the excellence of this installation, which will probably make Smethwick a place of pilgrimage for those engineers who desire to learn what can be done in this respect.

Official Trade Union Performances of the Week.

THE professional "leaders" of Trade Unionism have been trying their best to be somebodies during the past week. Like a good many other superfluous excrescences on the body politic, these persons have been relegated of late to an obscurity not at all to their taste; and they made a desperate effort to struggle into notoriety by means of a Conference on "Labour Representation" held in the Memorial Hall. The "Daily News" obligingly reported the proceedings, which were sustained by the stock company of "representatives from the British Trade Unions, "and a sprinkling of well-to-do delegates from the Fabian "Society, and a few of the sterner spokesmen of the "Social Democratic Federation." We know that galley. Still, the transactions of the Conference were marked by an accession of reasonableness which probably means more than appears on the surface. The hitherto prevailing idea that the cause of "Labour" was something essentially quite different from every other cause, was formally disowned. Some habitual speakers—one can scarcely call them workers—of the professional Labour party went over with all the usual enthusiasm to the side of those who have always urged that the working man was not an object for exclusive worship in the Commonwealth. Mr. John Burns and others professed their inability to understand why "working class" candidates for Parliament, or "working class" specialities in general, should be upheld in preference to subjects with broader recommendations. It was not even allowed that "members of the working "classes" should be credited with a better knowledge of the wants of "Labour" than other people. But is it not a fact that in times past—and not so long ago, either—the very contrary position was passionately maintained? When, during the strike in the engineering trades, Mr. George Barnes was told that it did not follow from his official position in the A.S.E. that he was the repositary of all wisdom and of perfect knowledge of what was best for workpeople, the reply was that working men preferred the leading of men of their own order. Many things have happened since then; among the rest, the professional wire-pullers of "Labour" have learnt that real victories are not won by manning the ship of State with a crew separated by water-tight compartments.

Before the end of the week, the same stock company of public performers appeared on successive days before the President of the Board of Trade and the Home Secretary, to communicate the views of "Labour" on a variety of matters. Mr. Ritchie had no hard task in disposing of the trivial suggestions offered by his deputation; and Sir M. W. Ridley was let off even more easily, inasmuch as one of the Trade Union grievances brought under his official notice was the existence of capital punishment! Very reasonably, the Home Secretary denied the competency of an association of Trade Unionists to give an opinion on such a subject. From this initial snub the Secretary of State proceeded to score off the deputation in the approved official style. He was looking into this matter; he was considering that subject; really, he could not agree with such a view of the work of the Department! And so the end came. "The deputation, having thanked the Home "Secretary for his courtesy in receiving them, withdrew." When will these self-styled practical men perceive that they are playing into the hands of the official element in Government, by carrying on this empty formalism? Court ceremonial is not more hollow than that which the working people of this country are taxed to support for the glorification of their representatives, in the blessed and sacred name of "organization."

Private Members' Futilities.

PARLIAMENTARY institutions are always open to attempts to abuse what is intended for the general good for the sake of particular interests. There are fair and above-board means of obtaining statutory protection for private concerns, in the Private Bill system. The constituencies are scarcely sufficiently alive to the extent to which the privilege enjoyed by private Members of Parliament of bringing in and backing Bills has been laid under contribution for the promotion of class legislation. Fortunately, the pressure of other business on the limited working time of Parliament is so great that it becomes more difficult every year for private members to get their little Bills passed through both Houses. There is a great outcry occasionally on this account; but, in reality, the practical blocking of this class of projects of legislation prevents much mischief. Of course, the knowledge that the backing of a Bill is generally a matter of form, is a temptation to many weak-kneed legislators to take this cheap means of currying favour with sections of their constituents. This is euphemistically styled "redeeming their election pledges;" but the whole thing is an undignified farce. Still, there is enough reality in the danger of undesirable legislation to compel the Government of the day to keep a tolerably sharp eye upon Private Members' Bills, so long as there is the remotest chance of their getting too far forward. After the back of the session is broken, the private members are left to one another's tender mercies, with the result of the House being counted out week after week, until the Administration mercifully appropriates every sitting for the finishing of the public business. We take the precaution every session of procuring copies of all the old and new Private Members' Bills that threaten interference with the trade and industries of the country, but rarely find it worth while to advert to them. Experience goes to indicate, however, that the quality of these Bills is deteriorating. Although ostensibly prepared by private members, many of them are plainly originated by certain classes and

organizations outside the House. A glaring example of this is a Boiler Registration and Inspection Bill, which proposes to make boiler inspection a monopoly for boiler makers. It is unnecessary to explain what this means. There are other Bills nearly as objectionable. It is difficult to think of a remedy for this abuse of the privilege of membership of the House, short of a general elevation of the sense of public duty in members themselves. So long, however, as the backing of all sorts of futilities of the kind is a useful political advertisement, it will continue to be perpetuated by men who ought to know better, who do know better, and would be the first to run away from their own Bills if there were the least prospect of their passing into law.

The Eight Hours for Miners Bill.

THE rejection by the House of Commons of the Eight Hours Bill for Miners (to which reference is made in another editorial paragraph to-day) is a matter for mild thankfulness, but more in respect of its being a check to a piece of mischievous faddism than by reason of its intrinsic importance. The debate on the Bill last Wednesday was redeemed largely by Sir James Joicey's common-sense speech. The curious thing about this proposed legislation for shortening the hours of labour of adult miners is that the North Countrymen reject it utterly. It is an outcome of the Miners' Federation, and a child of Mr. Ben Pickard. Originally the Welshmen objected to it as strongly as the Northerners; and it is a sign of their conquest by the Federation that they now profess to want it. What has become of the independence of the Welsh nation of which one occasionally hears in Parliament and elsewhere? Actually, the coal-mining population of Northumbria and Durham are standing out for the principle of Particularism, while the Welshmen have become absorbed. Of course, the Bill itself is nonsensical; and the arguments of Messrs. Pickard and Woods, who are its sponsors, are as illogical as their legislative proposal is baseless. Why do they invoke the aid of Parliament to limit the hours of adult male labour? What is the purpose to be served? We do not desire to bring the question of coal prices or the output into this question, but merely to endorse emphatically the contention that legislative interference with the freedom of male adult labour should only be resorted to when an overwhelming case can be made out upon sanitary grounds. We do not admit that a powerful popular demand should suffice to justify parliamentary interference with the liberty of the subject to work for his living. A nation that has known how to keep its Sunday off, and get a Saturday half-holiday as well, besides having generally a shorter week's labour than any other nation under the sun, does not want any coddling in this matter of working hours.

WATER AND SANITARY AFFAIRS.

THE Water Committee of the London County Council have at last completed their reply to the report of the Royal Commission on the Metropolitan Water Supply; but they regard it as of too much importance to appear upon the *agenda*, and therefore, in order to allow ample time for its consideration, it has been circulated to the members as a separate document. This we hope to deal with in an early issue. In the report of the Parliamentary Committee which is to come before the Council to-day, they make a long statement explanatory of the parliamentary procedure of the Council during the past few years in regard to the purchase of the undertakings of the Water Companies and the introduction of a supply of water from Wales. They point out that the preparation of the Purchase and Welsh Supply Bills of the present session was deferred as long as possible, in the hope that the report of the Royal Commission might be forthcoming. Ultimately, however, the Bills had to be settled and deposited before that document, or any information in regard to its tenor, was published. The Committee explain that the first-named measure has been framed substantially in the terms of the Bill discussed before Mr. Plunket's Committee of 1895, but so drafted as to admit of alteration in accordance with the recommendations of the Royal Commission. The Welsh Bill has been submitted this time with the full detailed plans of the scheme, embracing not only the works in Wales, but also the aqueducts to London. The whole project is thus now open for the consideration of Parliament and the public. The two Bills, as mentioned in the "JOURNAL" last week, are down for second reading next Tuesday. The Committee are impressed with the serious consequences of further delay in this matter; being convinced that "every year by which pur-"chase is postponed will tend to increase the cost." They consider that, if the facts of the case are "fully and fairly "stated to Her Majesty's Government," they can hardly now, in view of the report of the Commission, refuse to allow the Council's Bills to be referred to a Committee. It is proposed to ask the First Lord of the Treasury to receive a deputation on the subject from the Council. Should he consent to do so, use will in all probability be made of the somewhat alarmist letter of Mr. Shaw Lefevre, in yesterday's "Times," on the subject of the projected increase of reservoirs in the valleys of the Thames and Lea. Mr. Shaw Lefevre has visited Staines, and has come away "perfectly appalled" at the prospect of the multiplication of storage works such as those now in progress there. He endeavours to terrify Londoners by talking of "hideous "reservoirs towering above the country, and creating "what will almost be an artificial flood in the valleys of "the Thames and Lea;" and he contrasts this state of things with the beautiful placidity, combined with safety, of a Welsh lake. As a member of the County Council, Mr. Shaw Lefevre is, no doubt, greatly impressed with the superiority of their Welsh scheme to any system of storage reservoirs in the neighbourhood of the Metropolis, and is very desirous of having it sanctioned. Other people, however, venture to have different views on this matter. The writer raises in his letter some important engineering questions which there will be ample opportunity of discussing before any of the Bills dealing with this subject receive the Royal Assent.

While considerable difference of opinion exists, as was evidenced by the recent discussion at the meeting of the British Association of Water-Works Engineers, as to the desirability of forming a Central Board for controlling the water supply of the nation, most people are agreed that we have at present, in the Local Government Board, a Department of State capable of doing much good work of a supervisory character in connection with the above-mentioned branch of the public service. The operations of the Board are, no doubt, hampered to a certain extent by the routine inseparable from a Government office; but there is a very efficient staff of Medical and Engineering Inspectors, whose abilities are in constant requisition to guard the public against lavish expenditure on unnecessary works on the one hand, and on the other against the effects of too rigid economy in this direction. Moreover, at the head of the Department there is a Minister responsible to Parliament, and consequently liable to be questioned on any branch of the work of the permanent officials. This, in brief, is the machinery at the disposal of the public; and the bulky Blue-book issued every year bears witness to the extent of its operations. Referring here only to the work of the Board in connection with water supply, it may be remarked that, whether this is in the hands of Companies or Local Authorities, an investigation by an Inspector into any cause of complaint usually leads to prompt steps being taken to remove it. A case in which the Local Government Board have lately done some good work was mentioned in the "JOURNAL" last week, in the abstract of the report presented by Dr. G. S. Buchanan, one of their Medical Inspectors, on the results of his investigation into the outbreak of typhoid fever at Falmouth last year. Though the Water Company were in that case by no means blameless, neither were the Local Authority. The Inspector furnishes ample evidence that, in many important matters of public health, the administration by the authorities of the areas which are now comprised in the borough was in the past "regrettably "and conspicuously lax;" and he says it is to be feared that the present Town Council, who began work in 1892, have not very greatly improved matters. He advises the Council to consider not only the disposal of the sewage but the state of the drains and sewers; and he thinks the Water Company should frequently inspect their gathering-ground, improve their filters, and overhaul and cleanse their mains—taking care that leaks are stopped. This is good counsel to both offenders; and it is very wisely being followed.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 625.)

OWING to the more confident feeling inspired by the news from South Africa regarding the war, the tendency of the Stock Exchange was firmer during the greater part of the week. There has been, however, no indication that the public are inclined to abandon the cautious attitude they have maintained for some time past. It is generally recognized that, in spite of our recent successes, the struggle in South Africa is by no means over, unless the Boers see that it is hopeless to prolong the war. It is the fear that the campaign may degenerate into a guerilla war, and be prolonged for many months, that helps to check business upon the Stock Exchange. Investors are reported to be doing a little more in some markets, but not sufficient to encourage activity. Consols gradually improved; some purchases being induced by a conviction that no fresh creation will be made for some time to come. Other gilt-edged securities, though very inactive, have also presented a firm appearance. A complete change, however, came over the markets on Saturday, owing to the early introduction of the Budget. Money rates stiffened up; while the Stock Markets were very depressed. Consols declined to 100⅛. Gas stocks have also shared in the general quietude of other investment securities. But very few changes are recorded; and the market as a whole has shown steadiness. Gaslight ordinary was moderately active at times between 105 and 106; and a little business was also done in the secured stocks. The only alteration in the Metropolitan Companies was a rise of 1 in South Metropolitan ordinary to 133-136. The Suburban group was quite featureless. Brentford stocks have not recovered, though, as we mentioned last week, the proposed issue of debenture stock has been withdrawn. The most changes have been in the Foreign groups. Cagliari shares have fallen 1 to 26-28, and European ½ to 20-21; but, on the other hand, River Plate debentures rose 1 to 100-102, and Bombay shares ¼ to 6-6½. Imperial Continental shows a firmer tone, though there has been very little doing; but dealers have raised their buying price to 217. Water stocks were quite neglected; very little business being recorded throughout the week. The only alteration in values was a rise of 2 in East London ordinary and 1 in the 3 per cent. debentures.

Concerning the daily operations: Monday was a very quiet day; and no change was recorded in the value of gas stocks. A little business was done in Gaslight ordinary at 105 and 105½; while the 3 per cent. debentures changed hands at 99¼. Dealings were also marked in South Metropolitan at 134½ and British at 43¼. On Tuesday, business was even more quiet; and values were unaltered. Some dealings were recorded in Gaslight ordinary at 105¼ and 105, South Metropolitan at 135, Imperial Continental at 218, and European at 20½. In Water stocks, East London ordinary rose 2. Renewed inactivity prevailed on Wednesday, though a little more was done in Gaslight ordinary between 105¼ and 106; while the 3 per cent. debentures changed hands at 101. South Metropolitan ordinary (which rose 1 to 133-136) was dealt in at 133, and the 3 per cent. debentures at 100½. Tottenham "B" marked 103, and Bombay 6¼. Thursday was a very blank day; but some business was recorded in Gaslight ordinary at 106 and 105¼. On Friday, Southampton ordinary rose 2 to 117-122, Imperial Continental 1 to 217-220, River Plate debentures 1 to 100-102, and Bombay ¼ to 6-6½; but Cagliari declined 1 to 26-28. The feature, however, was the activity in Gaslight ordinary between 105¼ and 106, while some business was also done in the 4 per cent. preference at 120. Dealings were also recorded in South Metropolitan at 135 and 136, European at 20¾, San Paulo at 12 5/16, and River Plate at 11½. Saturday was another inactive day; but a little business was done in Gaslight ordinary at 105 and 105¾; while Imperial Continental changed hands at 218, European at 20¼, Monte Video at 11¼, River Plate at 11⅜, and San Paulo at 12.

ELECTRIC LIGHTING MEMORANDA.

Electric Power Schemes in Parliament—The Municipal Dog-in-the-Manger—Sound Criticism—Check to Municipalism.

THE subject of electricity-in-bulk generation and distribution came before Parliament last Wednesday, on the orders for the second reading of the Lancashire, Durham, and other electric power Bills. They were all read a second time, for the sake of the principle, on the understanding that they would be referred to a specially strong Committee, to be nominated later. This is satisfactory, as a salutary set-back to the inordinate pretensions of the municipalities to the monopoly of electricity supply. At the same time, the action of Parliament in accepting the principle of the Bills must not, and will not, be misunderstood as an expression of approval of the schemes involved. As we have already remarked in this column, these Bills are of various orders of merit; and it is even possible to go further and say that some of them have scarcely the remotest chance of becoming Acts of Parliament. This is purely on account of the character and quality of the promoters. It is inconceivable that Parliament should consent to hand over large areas to be exploited in the interest of enterprising "foreign" electricians—men who, however estimable, or even eminent, are known to have their hands full of general electrical business elsewhere. It appears to be incontestable that only local industrial enterprise can hope for the encouragement of Parliament in the effort to deliver national manufactures from the dead hand of municipal monopoly. The Electric Lighting Acts were never intended to mortgage the nascent interest of electricity supply to the municipalities. On the other hand, Parliament is not likely to permit private speculators to ride roughshod over local authorities.

This year, care has been taken in the drafting of the different Bills to disclaim any such ambition. The municipalities are indeed placed in a position of great power and influence; but the main issue is raised in every case of whether the facility of cheap and boundless electricity supply for industrial purposes over an extensive area should be denied to those who might be able to make good use of it, simply and solely because one or more local authorities occupying part of the region possess Electric Lighting Orders. Stated thus baldly, the question can only be answered in one sense. The crudity of the municipal position was displayed by Mr. Galloway, who declared that the opposition to the principle of the Bills was based on "the broad ground that, where municipalities had borrowed money on the security of the rates, with the consent and sanction of Parliament, they should not be subjected to the competition of private traders." This declaration, it is not surprising to hear, was greeted with cries of "Oh!" and "Why Not?" from the House. As a matter of fact, the municipalities went into electricity supply on exactly the same guarantee as that offered to any other undertakers. They knew what they were doing. Not one jot or tittle of the law of electric lighting has been changed; and now for them to arrogate to themselves a special and particular monopoly in the matter is only another way of stating a claim to do the business in their own way and for their own purposes. The claim of Manchester was endorsed by Huddersfield; but it was strongly contested by the representative of St. Helens, who argued that the supplying of electricity in bulk is far too big an enterprise for any municipal undertaking. He also alleged that the opposition to these Bills of the Association of Municipal Corporations is very largely a question of officialism.

Sir W. Harcourt, speaking with the authority of a long parliamentary experience, defended in respect of the Bills the old-fashioned principle of allowing private enterprise full scope. His remarks upon this head must have been as gall and wormwood to the modern Progressive mind. He desired the precedent of railway legislation to be followed in this regard, and condemned the existing electric lighting legislation as inadequate to the needs of the new industry. The Electric Lighting Acts treat electricity supply as an exclusively municipal concern, and make no provision for the doing of this kind of business by county areas. This is a defect of the law; but, according to Sir W. Harcourt, it is a defect which ought not to be remedied by Private Bills subject to no guiding principle. The point was well taken; and the President of the Board of Trade bowed to the criticism. All this, of course, was dead against the municipal claim. Mr. Ritchie went on to admit that the state of the electrical industries of this country is not on an equality with that found to prevail in other countries, for which backwardness the municipalizing spirit of the legislation of 1882 is responsible. Why should all the electrical supply business of South Lancashire pay the rates of the Corporation of Manchester? Nobody can say, except that the Corporation of Manchester like to have it so. On the other hand, everything connected with the higher development of electrical power has slipped out of British hands and been taken possession of by foreigners. It is not electrical machinery only that has largely to be imported, but also such things as steam-engines adapted to electrical work. Even Glasgow has been fain to go to America for its electric tramway engines.

If there is anything in electricity generation and supply in bulk—it is unnecessary to say for the moment whether there is or is not—municipalities should certainly not be permitted to stand in the way of it for their own selfish reasons. Local authorities cannot supply counties with electricity. Alderman Higginbotham, of Manchester, has undertaken to organize and inform parliamentary opposition to the Bills, indiscriminately "on the broad principle that this is an attempt to upset the now settled policy of Parliament that municipalities shall not allow competitors with the local authority in their own district when the power cannot be exercised without interfering with the streets of the municipality." This is moonshine. The use of overhead wires would circumvent the terms of the resolution. But why did not its framers mention the word "rates?" And what has Manchester to do with South Wales? The fears of the municipalities are not to be allayed by the engagement of the promoters of the Bills not to sell cheap electricity within their boundaries without permission. Naturally; for assuming the manufacturers just outside the Corporation boundary to be rejoicing in cheap electricity, it would be small gratification to those inside to know that they were supporting a maternal municipality who would carefully protect them from being supplied on the same terms. Hence the opposition of the organized municipalities to the Bills is an opposition to cheapened electricity, as such. This the House of Commons saw on Wednesday; and the knowledge so far paralyzed the opponents of the Bills that they dared not go to a division. It was a sweeping demolition of the fabric of Municipalism.

CONCERNING THE SCIENCE AND ART OF PUBLIC STREET LIGHTING.

In the numbers of the "Electrical Review" for the 22nd and 29th of December last there was published an essay by Mr. F. W. Carter, M.A., on "The Scientific Principles of Public Lighting by Arc Lamps," which resumes a study already opened out by Mr. A. P. Trotter in this country, and M. Maréchal in France. If we mistake not, Mr. Carter has also done some earlier mathematical work in the same field. In any case, the study of artificial lighting effects by the application of the principles of the science of Optics is still novel enough to warrant our paying particular attention to any addition to the scientific literature of the subject. As usual, the science has lagged behind the practice in this matter. Mr. Carter admits that public lighting by arc lamps has long passed its experimental stage, so that it may be questioned whether any further study of its underlying principles can be useful at this period, when anyone wishing to plan an installation need do no more than look up particulars of similar installations already in existence. He allows that hard-bought experience will remain the chief guide in this matter; for it alone will take account of all the circumstances of the case. But he nevertheless contends that knowledge of the principles of light distribution may tend to the improvement of systems. Of course, what is true of arc lighting is equally true of other kinds.

Mr. Carter begins by pointing out that artificial lighting differs so enormously from daylight, that it becomes a debatable question as to how it should be done. The ideal of lighting any place, particularly out of doors, like day, being unattainable, what had better be done in the circumstances and with the means available for the purpose? Daylight has two ideal qualities—quantity and uniformity. The former is beyond our imitation; but the latter is not wholly unapproachable, in its kind. Consequently, some maintain that artificial illumination should be as uniform as possible; while others contend that patches of bright artificial light, even with intervening stretches of comparative darkness, correspond better with the requirements of certain cases. Again, the circumstance of all artificial light proceeding from what Mr. Carter calls "discrete sources" has to be duly considered. The effective illumination derivable from an artificial source of light depends upon how it bears upon the object lighted. This has given rise to some differences as to how we should judge of the value of a system of lights—whether by their illumination of horizontal objects, of vertical objects, or of objects otherwise inclined. "While it is necessary to be able to see the roadway or ground as plainly as possible, it is also useful to be capable of easily distinguishing persons and objects standing vertically on the ground. So that a light that is too high up may illuminate the ground well, but be unsatisfactory on account of its nearly vertical rays only just grazing vertical objects. Again, one wishing to examine anything by artificial light naturally turns the object so that it shall be as highly illuminated as possible; so that, from this point of view, the maximum illumination is important." Since the lighting effects of lamps are additive, the effects of one supply a minimum upon which that of the whole is reared. Mr. Carter notes that in street lighting the effect of reflection from the frontages may be considerable. He also admits that the dazzling effect of electric arcs is a grave objection. What with one consideration and another, he willingly concedes that the scientific method alone cannot be trusted to solve the problem of finding a system of lights to satisfy specified conditions.

Nothing daunted, however, Mr. Carter proceeds to define the scientific terminology of lighting. It is unnecessary to repeat what he has to say about the unit of intensity, the candle power; but it is not very exact to describe the value of this unit as an amount of light "which does not differ very much from an ordinary paraffin or tallow candle." What make of tallow candle would satisfy this specification? Next, as is natural, Mr. Carter proceeds to explain the "law of inverse squares." This leads up to the case of light-sources which are not symmetrical—that is, which radiate different amounts of light in different directions; and also to the effect of the angle of presentation on the amount of light received by a surface. This is stated as follows: "The illumination of a surface at any point is proportional to the quantity of light falling on unit area at the point. It is measured in terms of the 'candle-foot,' which is the illumination of a surface facing a standard candle, and at a distance of 1 foot from it. . . Hence, if the intensity in a particular direction is 1 candle power, the illumination of a surface situated in that direction, distant r feet from the source, and facing it, is $\frac{1}{r^2}$ candle-feet. If the surface does not face the source, we have to multiply by the cosine of the angle through which it is turned from its position facing the source."

Thus started, Mr. Carter plunges into a thicket of mathematical expressions from which he triumphantly emerges with a handful of "Cartesian curves," showing the particulars of the illumination at any point due to a single lamp. It is difficult to resist the suspicion that it is scarcely worth while to go through so much to gain so little. However, the exercise is bracing to the mathematical faculty; and having found the lines once, a cardboard curve might be cut to enable the distribution of light to be drawn for other examples. Mr. Carter remarks that the datum of the minimum illumination between two lamps is "a suitable specification for street lighting." It is, however, a perilously small multiplicand to start with, if, as he states, it is usually, in England, "about 0·04 candle-foot for the principal streets." The minimum illumination of gas-lit side streets is stated on the same authority to be "only of the order 0·001 candle-foot." It should be observed in regard to this, however, that public lights in side streets are no more to be classified as "illumination" than the solitary policeman should be judged as a Lord Mayor's Show.

Mr. Carter does not admit any consideration to mar the symmetry of his calculations. Thus he speaks of lamps ranged along a street, and says that with such a disposition "some of their light will be wasted on the bordering buildings." Wasted! What then, it may be asked, constitutes a street, if the frontages are to be left out? Mr. Carter, in concluding his exercise, gives up the hope of uniformity of illumination when such intense sources of light as arc lamps are used; but he qualifies his despair by suggesting that higher lamp-posts, or the use of lanterns and reflectors sending out the greater part of the light "but little below the horizontal," will palliate the evil.

The truth of the matter is that in practice these matters are arranged without the smallest regard for the dictates of optical science. The early electricians, with their "tower lights," set all science and common sense at defiance; but they were not devoid of a glimmering of reason. They were followed by the more cunning impostors who, discovering that the term "candle-power" was something wherewith to charm public lighting authorities, invented "French measurement," and returned their arc lamps as of fourfold the average photometric intensity measured in one direction. Now the lighting of the public streets by arc lamps has come down to the prosaic setting of such lamps on posts 20 feet high, at intervals of from 50 to 60 yards. Even these are only too frequently put in the wrong place—that is, in the middle of the roadway, when they would be far more useful in the line of the kerb. We have pointed this out repeatedly, and are content to maintain that, for the convenience of people using cabs, omnibuses, and tramcars, street lights of any kind are far better fixed on the kerb. One would think it stands to reason that it is better to have the light on the mounting and dismounting side of vehicles; but this consideration belongs to the art of public lighting, not to its science, with which alone Mr. Carter is concerned.

In truth, the art of this matter is of vastly greater importance than the science. Latterly, by dint of sheer experiment, it has been discovered that, for spectacular effect, public lighting should not be limited to one plane. This truth was enunciated in the "Journal" very many years ago. We showed, in connection with the early attempts at lighting the Crystal Palace Nave by electricity, that it is impossible for the vision to penetrate through a plane of powerful overhead lighting and see anything beyond. In this connection, the Crystal Palace is so huge that the problems of its effective lighting are the same as those of streets and open spaces. Nowadays, the meaning of our contention has been grasped by those who never heard of it; and the frontages of theatres, public halls, and important buildings are lit up by lights at different heights. Only in this way is it possible to see the architecture. This is not photometrical science, it is scenic art. So, we maintain, should all problems of public lighting be approached. Unfortunately, when a public body get bemused by so-called scientific advisers in this matter, whose minds are clogged with statistics of candle power—and utterly meaningless at that—they lose sight of the artistic aspect of the question; and the consideration of public convenience is also forgotten. In this connection, we have to refer to the Editorial "Note" in the issue of the "Journal" for the 13th ult. (p. 393).

It is perhaps only to be expected that, in a business which involves so many unconnected objects, and is swayed by such diverse interests, as this of public street lighting, glaring inconsistencies of treatment should be exhibited in various localities. Such is the fact, at any rate. The use of the electric arc light at all for this purpose is actually only being attempted in some places, whereas other towns have been through the experience and given it up. The truth is that, in the hap-hazard British way of doing these things, such a problem is rarely, if ever, stated for solution strictly on its merits. There is usually some ulterior, and not always divulged, end to be subserved—revenue must be found for the electric lighting undertaking, or the gas company are to be snubbed, or the neighbourhood must be "in the fashion," or somebody's vanity must be flattered. This is neither science nor art, nor is it business; but it is more influential than all of them put together, in some places.

Oil for Removing Boiler Incrustation.—The use of petroleum for preventing incrustation in boilers is now adopted in a great many places. For this purpose petroleum injectors are used, by which means oil is supplied to the boiler in small drops. Generally the petroleum injected collects in small mineral deposits, and the light parts of the petroleum evaporate with the steam, while the heavy part, together with the deposits, forms an amorphous powder, which is very easily removed from the sides of the boiler. The quantity of petroleum used for the purpose is not more than half-a-pint per 24 hours.

THE LABOUR MARKET IN 1899.

A SUMMARY of the returns received by the Board of Trade each month relating to the state of employment during the past year has just been issued; and, as was certain to be the case, it shows that 1899 was a period of exceptionally good employment in almost all the principal branches of industry.

The returns received from Trade Unions connected with the engineering, shipbuilding, metal, building, and miscellaneous trades show that, of a total membership of some 500,000, only 2·4 per cent. were, on the average, unemployed during 1899; this being a lower percentage than in any of the seven preceding years, and hardly more than half the mean for that period—namely, 4·6 per cent. In respect of the coal trade, returns were received, chiefly from employers, relating to about two-thirds of the total number employed in and about coal mines. They show that the pits at which these persons were employed worked, on an average, 5·46 days per week throughout the year, or about one-fifth of a day more than the average for 1898, which was itself higher than in any of the preceding years. These returns only profess to state the number of days (allowance being made in all the calculations for short days) on which coal was hewn and wound at the collieries concerned. It does not necessarily follow that all the persons employed at these collieries worked the whole number of days. The statistics, however, are plainly indicative of unusual activity in the trade last year—an activity that was especially in evidence during the usually slack summer months.

The monthly returns received relating to the pig-iron trade are very complete, covering the great majority of the blast-furnaces of the kingdom. The statistics compiled therefrom show that a remarkable improvement in employment took place in that industry during 1899. At the works to which the returns relate, the number of furnaces in blast at the end of every month in the year was greater than the maximum recorded in 1898. A similarly marked improvement was witnessed in the manufactured iron and steel trades. The number of hands employed therein was higher by over 5 per cent.; while in the tinplate trade an even greater increase of employment was recorded. The number of mills at work rose from 349 at the end of April, 1899, to as many as 411 by the end of September; and the average number of workpeople employed during the year was higher by 15 per cent. than in 1898. As a result of this greatly increased activity in manufacturing industries, the scarcity of labour in agricultural districts—rapidly becoming the normal condition—was more marked than in former years. The casual harvest labourers being the class from which gas-works customarily draw a number of their winter hands, some considerable difficulty has undoubtedly been experienced this season in obtaining sufficient labourers. The problem of the unemployed has, for the present, solved itself.

A VETERAN SCOTTISH GAS MANAGER.

IT is with feelings of the deepest sincerity that we offer our hearty congratulations to-day to one of Scotland's veteran gas managers. Mr. Jesse Hall, Manager of the St. Andrews Gas-Works, entered his 81st year on the 10th of January last, and in the present month he will have held for half-a-century the position he now fills. Mr. Hall's association with St. Andrews extends over a longer period than this, as in 1845 he was engaged in superintending an addition to the College buildings and other works there. When these were finished, he removed to Edinburgh, and was employed in Her Majesty's Office of Works. Official duties causing his health to fail, he sought outdoor occupation. In 1849, the gas managership at St. Andrews became vacant by the removal of Mr. W. Foulis to Paisley; and Mr. Hall was selected, out of a leet of four, as his successor. In March, 1850, he entered the gate of the St. Andrews Gas-Works to take the superintendence of a very primitive concern. The price of gas was 8s. 4d. per 1000 cubic feet, with a charge for meters; and the annual make was $3\frac{1}{2}$ million cubic feet, calculated from the bulk of coal carbonized, for there was no station meter. The first result of Mr. Hall's appointment was a reduction of the price to 7s. 6d. in 1851; and since then it has been further lowered from time to time until it is now only 3s. 4d.—or 5s. less than when Mr. Hall entered upon his duties—while the yearly make is more than 36 millions. The original capital of the Company was £2500, in £10 shares; but it was increased by a second issue of 198 £12 shares—making together 448 shares. These were reduced by purchase in 1869 to 424, valued at £20 each, owing to additions made to the works. In 1850, the dividend was 12s. per share; but in 1851 it was increased to 15s., and it has since gradually risen to 50s. Half-a-century ago the shares fetched £12 10s. each; now they are readily purchased for £40 apiece.

Reference has been made above to additions to the works. The latter were erected in 1835, from the plans of Mr. Russell, Engineer and Manager of the Dundee Gas-Works; but during the past fifty years they have been so improved that hardly a trace of the original works is left. As the make of gas increased, Mr. Hall had to design and superintend the carrying out of the extensions, besides discharging the various duties of Treasurer, Secretary, and Collector; the meters being inspected four times a year. In 1862, he was allowed an assistant; and since then several young men have learned from him the rudiments of their profession, and are now filling responsible positions. Among them were two of his sons—Mr. T. Douglas Hall, of Montrose, and Mr. Robert Hall, of St. Andrews. Mr. Jesse Hall was President of the North British Association of Gas Managers in 1878, when the members met in St. Andrews, and his son Douglas in 1893. Mr. Hall's services were at one time not devoted exclusively to the Gas Company, as up till 1884 he had a large practice as an architect, to which his Directors did not object—in fact, his relations with them have all along been very cordial; and they have from time to time recognized in a tangible way their appreciation of their Manager's value. In 1892, they relieved him of some of his duties by appointing his youngest son his assistant; and he will eventually succeed to the management of an undertaking with which the larger portion of his respected father's varied and useful life-work has been associated.

RECENT PUBLICATIONS.

A Short History of the Progress of Scientific Chemistry in Our Own Times. By W. A. Tilden, D.Sc.Lond., &c. (Longmans, Green, and Co.).

This most interesting little book is the outcome of a course of "Lectures to Working Men," delivered by Professor Tilden in the spring of 1898, on the progress made in the science and practice of chemistry in the preceding sixty years—that is to say, during the Queen's reign. Professor Tilden was, he tells us, desirous of assisting his audience—most of whom possessed at least an elementary knowledge of physical science—by referring them to some book by the aid of which they could verify and amplify their notes of his lectures. But he could find no single book of moderate size and cost which afforded a historical survey of the succession of events which has led up to the system of theory in chemistry accepted at the present day. The book before us is intended to supply the deficiency; and the author is to be congratulated upon the admirable manner in which he has performed his task—not only in regard to the quality of the subject matter, but also in regard to the style which characterizes the writing, and the excellent arrangement of the various branches of the subject.

The period selected by Professor Tilden for his survey—from the commencement of the Queen's reign up to her Diamond Jubilee—appears at first sight to be purely arbitrary; but its justification from the scientific point of view is provided by recalling the fact that it was in the thirties that the influence of Liebig's teaching, which marked an epoch in the development of chemical research, began to make itself widely felt. It is, moreover, a fact that a revival and quickening of learning in its every branch characterized the period immediately preceding and succeeding the year of the Queen's succession. The author, in his introduction, disclaims having attempted to expound with fulness the present state of knowledge and of theory, but rather to show by what principal roads we have arrived at that state in regard to questions of general and fundamental importance. Professor Tilden, however, is better than his word; and no one can fail to more fully understand and appreciate the stores of knowledge now available to the student of chemical science, after a careful reading of this thoughtful survey of the means by which these stores were accumulated.

One thing that is brought clearly home to us in considering the advance that has been made in every branch of scientific knowledge during the past fifty and more years, is the impenetrability of the veil that hides from our human intelligence the solution of the fundamental problems of the universe. We know—that is, we think we know; every method of inductive reason proves—that atoms combine together. The atomic theory assumes that, since two elements combining in the same proportion may yet produce several distinct compounds, these compounds are produced by a different arrangement of the same number of atoms. But why, and by what impulsion, do atoms combine together at all? This has been, and, Professor Tilden says, probably wil always remain, "one of the fundamental but unsolved problems of chemistry." What, again, is the essential nature of gravitation, of magnetic attraction, of electrical induction? We can use these forces—we can even measure them—but do we understand them? The more we take count of what we do know, the more fully we appreciate the truth that at present we see but as in a glass, darkly.

Investigators are none the less, but rather the more, strongly drawn towards these realms of the unknown, the boundaries of which are steadily, if but infinitesimally, being contracted; and in no direction is the attraction more strong than towards the mysteries of the ultimate sources and properties of matter—not the least among which mysteries is the true nature of chemical affinity. "We not only do not yet know why substances unite together, but there is at present no measure of the law as to the distance through which particles of uniting substances may act upon each other. Nevertheless, speculation has, of course, not been wanting; and among the several hypotheses concerning the nature of chemical affinity, none has attracted more attention, or shown signs of greater vitality, than the one which

attributing chemical combination to the existence upon the atoms of charges of electricity of opposite kinds, in virtue of which they unite to form more or less completely neutral products." Another source of much speculation and discussion is the numerical relations among the atomic weights. "A large part of the interest attaching to this subject arises from its association with the question as to the probable nature and origin of the chemical elements. On the one hand, each of the elementary bodies may represent a separate creation independent of all the rest, and having nothing in common with them. On the other hand, supposing a relation can be traced between the masses of the atoms of which different elements are composed, then it is open to inquiry whether they may not have had a common origin; whether they may not represent several stages in a formative or evolutionary process, operating upon a primitive simple material; and whether, in that case, it may not be possible to transform one into another by the operation of agencies within the range of practicable experiment." The interesting theories of Newlands, and his "Law of Octaves," in respect of the numerical relations of the atomic weights of the elements, are fully discussed by Professor Tilden. We must not, however, be tempted into touching at any length upon this or any other of the subjects dealt with. The chapters on the origin and development of the ideas of valency and the linking of atoms, on the development of synthetical chemistry, and on electricity and chemical affinity, are of especial interest. The liquefaction of gases is considered in a much more judicial spirit than is to be observed in the writings of American enthusiasts. The chapter thereon forms a condensed, but sufficient, account of the progress made in this field of discovery.

In his conclusion, the Professor defends British chemists from the charge of having fallen behind in the race for pre-eminence in the advancement of knowledge, by reason of "inactivity, indolence, ignorance, and neglect," and speaks with hope of the future. "In the ancient Universities of Great Britain, where chemistry has not flourished with the vigour shown by the older studies, the spirit of mediævalism is no longer wholly predominant. We may therefore look forward hopefully to the day, not far distant, when Science and Letters, no longer fierce competitors for academic vantage, may walk hand in hand, each conscious of her own dignity, but ready to yield to the other her due share of honour."

The book is to be heartily commended to all students of the science of chemistry. Its value is increased by the addition of a table of important events in the history of that science since 1800 arranged in chronological order, an index of subjects, and an index of persons.

The Municipal Year Book for 1900. (Edward Lloyd, Limited.)

This publication, which grows more bulky each year, contains a vast amount of information relating to the municipal bodies of the United Kingdom, and the main features of the work they undertake. Separate sections are devoted to the principal municipal industries—the supply of gas, water, and electricity, the management of tramways, and the erection of artisans' dwellings and municipal lodging-houses. The subject-matter and statistics have, in many cases, been revised by officials of the various public bodies, and should therefore be reliable. Use is, of course, the only possible test of the accuracy of such a work. The intention is certainly excellent, and the arrangement good; but a scanning of the pages indicates that the proof-reading has not been up to the highest standard—which is a fatal observation to make in glancing through a book of reference, for it shakes one's faith in the absolute reliability of the figures. Would a careful "reader" have passed "Municipal Legislation in 1900," as a heading for pages devoted to a summary of the Acts obtained by public authorities in 1899? The error occurs on four pages out of seven. The writing is also somewhat slip-shod. For example, in the summary of the report of the Metropolitan Water Commission, the past and present tenses are used quite indiscriminately, even in the same sentence. If a work like the Stock Exchange Year Book, with ten times the amount of matter, can be issued without a single blunder throughout its text, why cannot publications of more modest dimensions be equally accurate? If it be a question of money, we can only say that a work of reference which bears the mark of carelessness in its compilation is dear at any price.

The Editor asks for suggestions for improvements in new editions. We therefore mention one point, in respect of which a change for the better might, we think, be adopted with advantage. In the summary of the population, area, work, &c., of each municipality which is engaged in any of the industries to which separate sections are devoted (gas, water, &c.), a reference is made to such section or sections. The number given in the reference is, however, only that of the first page of the section. It would be much more useful if the reader were referred instead to the actual page on which is to be found the information respecting the particular municipality concerned. We may add that it would also be an improvement if the references were given in all cases, instead of only in some. Instances of the omission are numerous.

The production of coal last year by the collieries comprised in the German Coal Syndicate was 48,024,014 tons. The corresponding output in 1898 was 44,865,536 tons; so that the production increased last year to the extent of 3,158,478 tons.

PERSONAL.

Mr. HAROLD S. WILLIAMS has been appointed Assistant Gas Manager to the Lancaster Corporation.

Mr. FRANK MORRIS, formerly Engineer and Manager of the Brentford Gas Company, has been elected a Director of the Uxbridge and Hillingdon Gas Company.

After thirty years' service, the Engineer and Manager of the Canterbury Gas and Water Company, Mr. T. MAY, Assoc.M. Inst.C.E., intends to retire very shortly. The Directors have offered him the appointment of Consulting Manager.

Mr. E. P. REILLY, who, as was recently announced in the "JOURNAL," has relinquished the position of Manager of the Guildford Gaslight Company, has been appointed Manager of the Cape Town and District Gas Company, in succession to Mr. Sidney E. Stevenson; and he will sail for the Cape about the end of the month.

[It was Mr. Arthur Easton, not Alfred, who was recently appointed Manager of the Faversham Gas-Works, as mentioned in last week's "JOURNAL."]

OBITUARY.

Ex-Bailie GOW, of Perth, who was for a number of years Convener of the Works Committee of the Perth Gas Commission, died at Perth last Thursday. He had been in office on one or more of the public boards in the city for thirty years. Only last year he retired into private life.

Mr. JOHN M'LANDSBOROUGH, of Bradford, whose name is associated with the water undertakings at Shipley, Horsforth, and Clitheroe, as well as with drainage works at Burley, Yeadon, and elsewhere, died on the 24th ult., at the advanced age of eighty. He began practice as a civil engineer at Bradford in 1850, and retired in 1882.

The death occurred on Saturday, the 24th ult., in his 89th year, of Mr. PETER SCHUYLER BRUFF, of Handford Lodge, Ipswich. Deceased was one of the founders of the Tendring Hundred Water Company, of which he was Managing-Director, and for some time Chairman. He was the oldest member of the Institution of Civil Engineers, having been elected in 1840.

We regret to record the death, on the 6th ult., of Mr. DAVID STIVEN, Engineer and Manager of the St. Thomas (Danish West Indies) Gas-Works. About nine months ago, Mr. Stiven had a stroke of paralysis which affected his right side. This was followed four months later by a second attack, which rendered him unfit for his duties; and his son, Mr. David D. Stiven, who was then with Mr. Herring, in Edinburgh, was sent for to undertake them. Mr. Stiven, junr., arrived in October and relieved his father; but, though the latter's health improved, it had really broken down, and he passed away on the above-named day. He had held his position for 31 years. When he went to St. Thomas, the Company were in a sad condition; but after a few years he not only brought the undertaking out of debt, but enabled the Directors to declare dividends of 10 and 12 per cent. The place has, however, gone down; and the Company are now paying only 7½ per cent. to the preference, and 2 per cent. to the ordinary shareholders. Mr. Stiven was a member of the Gas Institute; having been elected in 1877.

NOTES.

Draughts in Houses.

The necessity for knowing with tolerable accuracy how much heat is required for keeping up the inside temperature of an inhabited house to any given average, has been forced upon American heating and ventilating engineers by the conditions of steam heating practice. Mr. W. S. Munroe states that in any heating system it is necessary, first, to replace the heat lost by convection and radiation from the windows and walls of the building to the colder surroundings outside; secondly, to heat to the required temperature any air that may be intentionally admitted for ventilation; and thirdly, to heat also the air admitted unintentionally through cracks of window frames, porous walls, and opening doors. He remarks that the amount of heat required for the last cause is much greater than is generally supposed. The quantity of air that will pass through the walls of an apparently tight room is incredible to those who have not familiarized themselves with the phenomenon by actual experiment. Mr. Munroe does not know of any experimental data on this subject; but he knows that when the wind is blowing hard and the weather is cold, it is always possible to find a decided current of air flowing through any building in the same direction as the wind out of doors. Sealing up windows and doors will not prevent this effect, which is most noticeable along the floors. Mr. Munroe argues that buildings should be made much tighter than they are, making proper provision for ventilation; because the current of cold air along the floor, which is the inevitable product of the ordinary no-system, is about the worst and most comfortless method of "natural" ventilation conceivable. Wooden floors with concrete filling are good to start with; and the walls around the joists should be painted with a heavy coat of asphalt

paint. It is largely due to the uncertainty introduced by this element of air leakage that heating calculations for interiors are so often wrong. Rooms which seem to quickly get "stuffy" at ordinary temperatures, are discovered to be like sieves when the outside temperature is below 20° Fahr. with a brisk wind.

Testing Portland Cement for Soundness.

A Committee of the Associated German Portland Cement Manufacturers, in conjunction with the Mechanical Testing Laboratory at Charlottenburg, has been engaged investigating the trustworthiness of various quick tests for the soundness (constancy of volume) of portland cement. It is acknowledged that this quality of soundness is of cardinal importance in portland cement; and it is also admitted that it has no necessary connection with other qualities of the material—as strength, fineness, or weight. Mr. Gary had charge of the experiments designed to elucidate this matter of soundness, which is the same thing as constancy of volume; and he attempted to systematize the signs of cracking, warping, and other movements of the test pats and balls referable to this character. Soundness or the opposite is inferred from the behaviour of flat cakes, and in particular from the result of the boiling test of Michaelis and others. The latter is greatly affected by the age of the cement. The general result of the investigation was to show that there is no quick and easy test to be relied upon for showing whether a sample of cement will stand all requirements of practical use. Still the boiling test for soundness will be provisionally retained at Charlottenburg. The Committee offer the hint that the tests of cement may sometimes bear some relation to the use to which it is to be put—as, for example, cement work which is to be kept hot and dry may not be suited for the same make of the material that would be proper for a breakwater.

Compressed Air Power Transmission.

In connection with what is so often heard nowadays in praise of the electrical driving of machine tools, it is interesting to note that, for other purposes besides the mechanical stoking of gas-retorts, pneumatic power continues to hold its own. It is seriously maintained by some American authorities that the mechanical power traction of tramcars in busy localities is better done by the agency of strongly compressed air than by any other means. Recently, "Engineering" had occasion to chronicle the fact that revival of interest in pneumatically operated machinery has been a marked feature of the last few years. It is remarked that pneumatic engineering underwent a considerable development during the first half of the century; but vacuum rather than pressure plant was fashionable in those days. Pneumatic pressure tubes for the despatch of parcels are familiar conveniences; and there is at least a possibility that the system may be extensively developed in coming years. Referring to the driving of workshop tools, where electricity had the start, this agency is already being superseded for many purposes by pneumatic driving. The pneumatic riveter is a most useful tool. The pneumatic hoist or lift is capable of doing much service. True, the enterprise of Popp in distributing pneumatic power in Paris came to the end of its possibilities some time ago; but the great point to be made is that those who use pneumatic power for gas-retort stoking machinery—for which purpose it is admirably adapted—need be under no misapprehension as regards the class and modernity of this order of machinery. It is far more advanced than many more showy secondary movers.

Coke-Breeze for Fire Resisting.

In a paper on the construction of industrial block dwellings in towns, Mr. T. Blashill lays it down that the floors of rooms should at least be made "fire resisting." He thinks that pugging between the wood joists would be sufficient; but all the floors in the dwellings put up by the London County Council are made of coke-breeze and cement carried by steel joists. They are thinner than wood floors, saving a course of brickwork in all walls, and they have been found somewhat cheaper; but this must depend upon the price of steel. Care is required in mixing the coke-breeze concrete, and in applying it so as to be firmly held by the flanges of the joists, which should be rather wide. Mr. Blashill recommends these fire-resisting floors for convenience of construction as well as cheapness. All floors have thin floor boards nailed down close on the coke breeze after this is quite dry. It has been elsewhere stated that, for the sake of rigidity, steel floor joists should never be used for a greater span than twenty or twenty-two times their depth. As bearing on this subject of fire resisting floor construction, it has been a matter of remark that the London building by-laws permit of the construction mentioned by Mr. Blashill, of wood joists pugged in between. Mr. Ellis Marsland has written to the "Builder" describing a test of the slightest construction of floor permitted by the schedule, which he says has set his mind at rest on this point. The experimental floor was constructed of 7 in. by 2 in. fir joists, placed 12 inches apart. Coke breeze cement concrete, gauged 5 to 1, was filled in between the joists to a depth of 5 inches from the top level, upon temporary wooden centering. When the centering was removed, a $\frac{5}{8}$-inch match-lined ceiling was nailed up underneath the joists, and a $\frac{7}{8}$-inch deal flooring was nailed on top of them. The floor was then loaded with 100 lbs. to the foot super, and a fire made up under it, raising the temperature to 2000° Fahr., which it successfully withstood for an hour and twenty minutes. Mr. Marsland is loud in praise of coke-breeze concrete as a fire-resisting material. He knows nothing better for the purpose.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

The Annual Meeting of this Association was held on Thursday at the Grand Hotel, Birmingham. The PRESIDENT (Mr. J. Ferguson Bell, of Stafford) occupied the chair; and there was an excellent attendance of members.

CONFIRMATION OF MINUTES.

The HON. SECRETARY (Mr. Charles Meiklejohn, of Rugby) read the minutes of the meeting held on Oct. 26 last; and they were confirmed.

ANNUAL REPORT AND STATEMENT OF ACCOUNTS.

On the motion of Mr. B. W. SMITH (Smethwick), seconded by Mr. A. COOKE (Oldbury), the annual report of the Committee and the statement of accounts, which had been circulated among the members, were taken as read. The former reviewed the proceedings of the past year; and in one of the concluding paragraphs, the Committee regretted that during the year three members had died—viz., Mr. W. Parsons, of Atherstone; Mr. J. Fryer, of Market Harborough; and Mr. J. Ward, of Brierley Hill. It was also mentioned that three new members had joined, one had resigned, and three had ceased to be members under rule 15. With regard to the financial statement, it was shown that the balance in hand was £97 11s. 11d.

ADDITIONS TO THE ROLL.

The HON. SECRETARY then submitted the following nominations for membership: Mr. Edward Onions, of Loughborough; Mr. C. E. Parsons, of Atherstone; Mr. H. G. Harrison, of Derby; Mr. F. A. Winstanley, of Rotherham; Mr. W. Gorse, of Walsall; Mr. A. T. Harris, of Market Harborough; and Mr. H. H. Everest, of Whittington, near Chesterfield.

The PRESIDENT remarked that he thought it was a matter for congratulation that they had so many nominations at this meeting.

Mr. SMITH moved, and Mr. J. S. REEVES (Bilston) seconded, that the gentlemen named be elected members of the Association; and this was unanimously agreed to.

THE LATE MR. J. FRYER.

The PRESIDENT said that, before he delivered his address, he would ask the Secretary to make a few remarks with reference to a matter that had been before the Committee and also before the members. He referred to the death of Mr. J. Fryer, of Market Harborough.

The HON. SECRETARY said, as the result of the appeal circulated among the members, the sum subscribed up to date was £64 9s. 6d.; and as the result of the appeal through the technical journals, he had received £39 17s. from sympathizers outside the Association—making a total of £104 6s. 6d. In addition to this, £4 4s. had been promised, but had not yet come to hand. These amounts would together give a total of above 100 guineas. He might also add that one of the boys had been practically assured for election to the Royal Masonic Institution for Boys, which would provide for him for the next eight years or so; and, by the kindness of a member of the Association, some efforts had been made to get one of the girls into a local orphanage. But this was not quite settled yet. In regard to the local fund which had been raised by the people of Market Harborough, he (Mr. Meiklejohn) saw the Chairman of the Gas Committee the previous day, and was informed that they had raised a total of £180 from among the old shareholders of the Gas Company and the members of the District Council, under whom Mr. Fryer served. It had been agreed by the promoters of the local fund, and by the Committee of the Association, that representatives of each should meet, in order to agree to some joint method of distributing the money so that there might not be any overlapping.

The PRESIDENT said he thought the statement of the Secretary would be considered eminently satisfactory.

Mr. THOMAS GLOVER (West Bromwich) said he did not know whether there would be a further report on this matter; but in case there should not be, he would like to say that he thought every member felt the Association were indebted to Mr. Meiklejohn for the way in which he had carried the matter through. He had been at some considerable trouble—he (Mr. Glover) thought it had been a pleasure to him; but at the same time he had done the work very well. He did not think the matter would have been taken up as it was, had it not been for the initiative of Mr. Meiklejohn.

Mr. J. A. HARRIS (Wigston) said he was delighted with the result of the appeal which had been made. Living in the same neighbourhood as the late Mr. Fryer, he knew him well. About three years ago, he lost his wife, and since then he had had to battle along with five children, two of whom were very weak and sickly; and so no one really knew what Mr. Fryer had had to contend with. He (Mr. Harris) knew the family circumstances perhaps better than anyone present; and he could say that what had been done was highly appreciated by Mr. Fryer's parents, and by his brothers and sister.

The PRESIDENT then delivered the following

INAUGURAL ADDRESS.

Permit me to commence my address with an expression of cordial thanks for the honour you have conferred upon me by electing me your President. I am conscious I cannot in many ways equal the able men who have preceded me. But the duties of the office shall have my fullest and best attention; and I hope, with the assistance of the members, to maintain the interests and usefulness of our Association, so that we may continue to prosper both individually and collectively, and accomplish useful work for the gas industry.

It is now 23 years since the Association was formed, in order that those united by mutual interests might know each other better, and bring to the notice of members any modern improvements effected, and the results of investigations which from time to time occupy their attention; and as past records contain some of the most important advances and achievements connected with our industry, so we must endeavour to keep in the van of progress, and lay the foundations deeper and broader every year.

During the past year we welcomed three new members; but unfortunately we lost, by death, Mr. W. Parsons, of Atherstone, Mr. J. Fryer, of Market Harborough, and Mr. J. Ward, of Brierley Hill—all men of worth, and whose places will not be readily filled. Also our friend Mr. Tindall, of Walsall, has retired from his more active duties—full of honour—and I trust we may for many years continue to see him among us. The numerical strength of the Association remains the same—85 members; and I am happy to say that the Association, which year by year has gradually risen by continued steady progress to its present prosperous condition, is a united and flourishing society.

The introduction of coal gas for lighting and other purposes only dates from the commencement of the present century, which has now entered upon its closing year. From that time to the present, there has been a continuous and amazing increase in its use, notwithstanding the rapid spread of the electric light and other artificial means of illumination. The increase continues; and as gas is now used for so many purposes in addition to lighting, we may reasonably conclude that future developments will continue to be made, and it is our business to see that the rate of progress is maintained, so far as improved conditions and circumstances permit of the introduction of the best and most modern appliances, in order that gas in the future may be supplied still cheaper and better. One step in this direction, in these days of rapid progress and keen competition, is to consolidate our forces. Hence the desirability of greater unity; and evidence is fortunately not wanting of an approaching fusion of the two Institutions, which is a matter for congratulation. It is now nine years since the Institution of Gas Engineers was formed by members of the profession who believed that changes involving grave issues were necessary in the constitution of the Gas Institute; and it was thought these could best be obtained by means of a new Association.

Altogether, from whatever aspect we regard either Society, it is felt that the welfare, harmony, and prestige of the profession will be best served by the amalgamation of both bodies. I hope this year to see both the Gas Institute and the Institution of Gas Engineers dissolved and re-formed into one Institute worthy of the gas industry. There should be nothing insuperable in the way of re-union; and by a full recognition of the just claims of the members of both Associations, a permanent and advantageous settlement should be easily attainable. Further, I hope to see the various District Associations affiliated to the new Institution by some scheme which will be acceptable to the district members, and thereby add to their dignity and be a source of strength to both. It only requires the active co-operation of the various members to unite our divided forces, and to thereby carry into effect what most members will agree is both desirable and expedient—a united National Gas Engineers' Association.

An endeavour to cultivate friendly relations between capital and labour by the introduction of profit-sharing, whereby those actually employed may have some share in the prosperity that is created by their labour, over and above the remuneration agreed upon, is well worth the serious consideration of those who desire to see established a bond of union between employer and employed; and greater unity and harmony are absolutely necessary between capital and labour if this country is to maintain its industrial supremacy. I am persuaded that a system of profit-sharing on the lines so successfully introduced by Mr. George Livesey, who has done so much for the gas industry, is a means whereby industrial peace may be preserved, and mutual trust established between employers and employed, and hence cause a more zealous performance of duties which must eventually lead to better results. More than twelve months since, I suggested to my Committee that the introduction of profit-sharing in our gas and electricity works would be to the advantage of the undertaking; and, after some consideration, it was unanimously passed by the Council, and I hope we shall have our first division of profits next May. At some future time, I will gladly avail myself of an opportunity to lay before the members full details of our profit-sharing scheme, and give the results. I can only say that never were the relations more pleasant and harmonious than at the present time.

It is now eighteen months since the Workmen's Compensation Act of 1897 came into operation. It marked a new departure in the law relating to the liability of employers for injuries to their workpeople. The new Act is a direct tax upon certain industries for the accidents that occur from time to time; and now a large number of industrial employments are liable to pay compensation for all accidents, and are only exempt upon the serious and wilful misconduct of the injured. Previously, in whatever way a workman sustained injury, unless negligence could be sustained upon the part of the employer, the workman had no remedy. This, in most cases, was a great hardship. Under the new Act, compensation is not payable until after the first fortnight, and is limited to half the average weekly wage up to £1 per week; and in case of a fatal accident, the amount of compensation payable is fixed at three years' wages—the total amount not to be less than £150, nor more than £300. Such is a brief summary of the Act, which created such an outcry, and caused the Insurance Companies to ask premiums for this class of risk at excessively high rates; so that, if employers had been obliged to pay the premiums asked, it would have meant a serious additional tax.

I think all members of this Association will agree that the Workmen's Compensation Act of 1897 is a beneficent one, as it seems only fair and reasonable that the products of any industry should bear the risks connected therewith. This being my opinion, we have for many years insured all our employees against all accidents; the premiums being 9s. 6d. per cent. upon the wages paid each year. The limit of compensation was half wages up to 26 weeks, and in case of a fatal accident one year's wage. But compensation was payable from the date of the accident. Now, taking five years prior to the Workmen's Compensation Act of 1897 coming into force, I find we received for accident claims 2s. 8d. per cent. per annum upon the wages; but had compensation not commenced until fourteen days after the date of the accident, the amount received would only have been 2s. per cent. In other words, if no compensation is payable during the first fortnight, the claims are reduced about one-third. Seeing we had insured all employees against all accidents at 9s. 6d. per cent. upon the wages paid, we were not inclined to have our premiums increased from 9s. 6d. to 25s. per cent., but took the additional liability under the new Act ourselves, until the Insurance Companies were prepared to quote rates commensurate with the risks.

I am glad to find the Insurance Companies are at last quoting more reasonable premiums; and gas-works can now cover their employees at 3s. 3d. per cent. upon the wages paid—to include the Workmen's Compensation Act of 1897, the Employers' Liability Act of 1880, and claims at common law. If payments are to be made during the first fortnight, and the policies endorsed to cover all accidents, the risk may be met by a premium of 7s. per cent. An increase in the wages account of little more than one-third of 1 per cent. cannot entail any hardship; and insurance against all accidents is undoubtedly the best plan, and a great boon to the employees. If insurance is effected, it is best to cover all accidents; otherwise, in the event of an accident happening, payment will only be made where a clear legal liability exists, which may be a cause of friction.

It is not my intention to describe the works which for a number of years have been under my control, as I hope to have the pleasure of seeing the members at Stafford in May next, when your criticism will be welcomed.

The present time is one of great activity; and within the last few years marked improvements have been effected, by the introduction of machinery for drawing and charging retorts. There is also a rapid increase in installations of inclined retorts; a noticeable feature being the adoption of conveyors for coal and coke—all of which tend to economy. A judicious capital expenditure in retort-house improvements will be found a profitable investment, as it does not pay to work with old and antiquated plant which should be consigned to the scrap heap, especially when capital may be obtained at a comparatively low rate of interest. My experience is that with simple regenerator furnaces, with air and spent-gas flues on each side, built of fire-bricks with cross baffle bricks, there being one furnace to each setting of nine 22 inch by 16 inch oval ⌂ through retorts, a make of 144,000 cubic feet per diem may be reckoned on with any ordinary quality of gas coal, and a fuel consumption of from 15 to 20 per cent. of the coke made. The best way to check the working of the furnaces is not only to note the temperature in the flues, but to make a periodical test of the spent gases for carbonic acid, which may be simply and expeditiously done in an Orsat-Muncke apparatus.

The efficient condensation of gas is of much greater importance than is often attached to this operation; and much of the naphthalene troubles arise from defective condensation. The higher temperature of carbonization increases the percentage of benzene and naphthalene at the expense of the methane and other series of hydrocarbons, and the gas becomes saturated with naphthalene vapour precisely as aqueous vapour occurs in the atmosphere, with the result that a reduction of temperature means that naphthalene is deposited.

An erroneous opinion at one time existed that the production of naphthalene was influenced by physical and mechanical action, such as sudden cooling, friction, &c. But practical researches prove that it is formed in the retorts by the decomposition of other hydrocarbons which are split up upon being

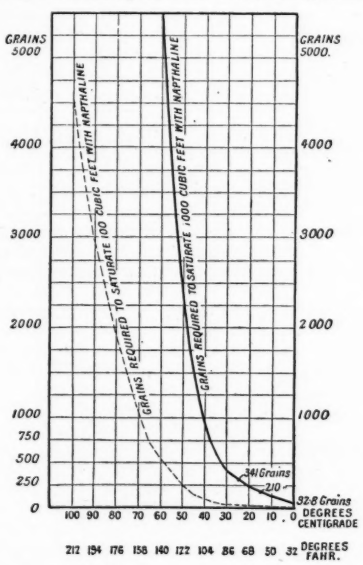
exposed to a high temperature, and that it cannot be produced by the cooled constituents of crude gas after it leaves the retort.

The amount of naphthalene produced from a ton of coal carbonized varies very considerably; but it is always sufficient to saturate the gas produced many times over. Fortunately, nearly the whole of the naphthalene produced is dissolved out, along with the other condensable hydrocarbons; and hence it passes into the tar—the solvent powers of the constituents of coal tar having a great affinity for naphthalene.

Mr. Malam in 1874, and Herr Fleischer in 1875, found that sprinkling the purifying material in the purifiers with coal-tar naphtha, was a means of preventing the deposit of naphthalene. This is one method of making up the deficiency of the lighter hydrocarbon vapours, which are capable of dissolving the naphthalene; and many have found it useful. Mr. W. Young, who has made the naphthalene question a special study, devised a process for dissolving it out of the gas by washing with ordinary heavy coal-tar oil. Dr. Bueb, of Dessau, carried out this process on a limited scale, which proved successful. He added 3 per cent. of benzol (so that the oil might not deteriorate the illuminating power), and found the creosote oil continued to absorb naphthalene until it contained as much as 15 per cent., when it was found to be saturated and unfit for further use. The naphthalene eliminated was about 200 grains per 1000 cubic feet; and the cost of this process is given as 0·045d. per 1000 cubic feet.

There are many cures for this troublesome deposit; but I think the best remedy is to aim at preventing the evil arising, which may be done by good and abundant condensation—the cheapest, and probably the most effective, means of avoiding naphthalene stoppages. The deposits generally take place in late summer and autumn, when there are wide differences between the day and night temperatures. I have plotted on a diagram

CURVE *showing Weight in Grains of Naphthalene required to Saturate* 100 *Cubic Feet of Gas from* 32° *to* 212° *Fahr. Compiled from Experiments made by Mr.* R. W. ALLEN, M.A.



the figures given by Mr. R. W. Allen, M.A., of the weight of naphthalene, in grains, required to saturate 1000 cubic feet of coal gas as the temperature rises from 32° to 212° Fahr. Although different qualities of coal gas contain a great many hydrocarbons of variable vapour tensions, the data are valuable and show at a glance the great difference in carrying power due to increase of temperature. At 32° Fahr., the naphthalene vapour required to saturate 1000 cubic feet is only 32·8 grains; whereas at 59° Fahr. it is 210 grains, and at 77° Fahr. no less than 341 grains. These figures show the important part temperature plays, and that it is of the utmost importance to cool the gas down to as low a temperature as that to which it will fall during distribution.

Ordinary illuminating coal gas will not carry more than from 150 to 200 grains before saturation; and with this quantity will give serious trouble. The reduction in illuminating power due to the removal of this comparatively small amount of naphthalene will generally be found to be not more than from 0·1 to 0·2 candles; and we may therefore ignore the idea of utilizing it as an enricher.

My opinion is that a system of condensation whereby the gas is very gradually cooled, and the hydrocarbon vapours kept in contact with the gas and allowed time to dissolve the naphthalene, will dispel the trouble arising from naphthalene deposits; but the gas must be sufficiently cooled before it leaves the condensing plant.

It has been truly said that the man who makes two blades of grass grow where one grew before is a benefactor to his kind; and seeing the fertilizing value that nitrogen possesses, it is inexcusable not to eliminate all the ammonia from the crude gas before passing it forward to the purifiers, especially as there are now so many really good washers and scrubbers available. I have found that the washer invented by one of our most distinguished members, Mr. Charles Hunt, is admirably adapted for this purpose; and by its use a large percentage of the carbon dioxide and hydrogen sulphide may be removed, along with the ammonia, from the crude gas, thereby considerably reducing the cost of purification.

According to Sir William Crookes, F.R.S., we are threatened with a shortage of wheat, and that within measurable distance, which would mean starvation. The only hope held out to us that this terrible fate may be averted, is by the copious use of nitrogen, whereby we may considerably increase the growth of natural food. So please remember that in the use of ammonia as a fertilizer is the hope of mankind's delivery from famine. The guano deposits of South America are becoming rapidly exhausted. Hence it is necessary to utilize as far as possible all the available sources of combined nitrogen, as the great achievement to which chemists look forward—to fix by some cheap process the nitrogen in the atmosphere, and make it available for plant growth—appears at present out of the question.

Crude ammoniacal liquor can be readily either concentrated or worked up into ammonium sulphate by any of the modern continuous working stills; and with a well-arranged plant of ample capacity the ammonia in the spent liquor may be reduced to 0·003 per cent. The waste liquor is sometimes troublesome, as it contains lime in suspension, besides traces of ammonia, sulphide, sulphate, cyanide, tarry acids, &c., and is of a brown colour, with an unpleasant tarry smell. Hence local authorities object to it going into water-courses, and even into the sewers, although its disinfecting action is to a certain extent beneficial. I find that by allowing it to flow into tanks, and thereby precipitating the lime, it may then be used for quenching hot coke without in any way deteriorating the coke or causing little or any inconvenience. The water from the condensers and scrubbers, which contains sulphuretted hydrogen, is most objectionable, and should be kept separate. One means of getting rid of it, is to work it through the still.

The legislative penalties for sulphur impurities, which were at one time strongly opposed, have been beneficial rather than otherwise, as they were the means of directing more attention to the better purification of gas, thereby making it more acceptable to the consumer. It is an obligation on those supplying gas to reduce the sulphur to as low a limit as possible; and gas companies, as a rule, are limited not to exceed a prescribed quantity of about 20 grains per 100 cubic feet. Although corporations who carry on gas-works are not generally so restricted, the time cannot be far distant when the law in this matter will be made to apply equally to companies and local authorities, as the presence of from 30 to 40 grains of sulphur in the gas is not only noticeable, but harmful when used for lighting purposes in rooms badly ventilated—and unfortunately most rooms are defective in this respect. Gas containing 30 grains of sulphur per 100 cubic feet will evolve upon combustion about three times this quantity of sulphurous acid, which no doubt is a very small quantity, especially if comparison be made by volume with the cubic contents of an ordinary room. It may appear almost unappreciable. But, as the late Professor Tyndall remarked, "No chemist ever weighed the perfume of a rose;" yet we notice the difference when a bunch is brought into a room. Hence, although the difference between 20, 30, or 40 grains of sulphur in 100 cubic feet of gas (which weigh 22,500 grains) may appear imperceptible, yet they have an appreciable effect; and if the interests of consumers are studied, the sulphur impurities will be reduced from 10 to 20 grains per 100 cubic feet, which may be effected at a cost for purification (leaving out interest on capital charges) varying from ½d. to 1d. per 1000 cubic feet of gas sold.

The carbonic acid present as the coal gas leaves the scrubbers or washers varies from 1·2 to 1·8 per cent. by volume; and if the sulphur compounds are to be dealt with, it is well known that this carbon dioxide must first be eliminated. But it generally pays to take it out, as 1 per cent. of carbonic acid means a reduction in the illuminating power of at least half-a-candle in 17-candle power gas. The poorer the quality, so the lowering effect increases; and, further, gas containing much carbonic acid burns with a dull-red flame.

I am of opinion that gas of about 16-candle power, free from sulphur impurities and carbonic acid, will generally be found to answer all the requirements of consumers better than richer gas not equally purified. I believe there are as many complaints about the quality of the gas in towns where 20-candle power gas and upwards is supplied as in those districts where the quality is only 16-candle power.

The suppliers of gas should not be content to afford an efficient supply at the outlet of the meter, but see that the supply is efficient right up to the burner, and that the gas is being used with some regard to economy and efficiency. Hence I advocate the desirability of a gas-fittings department, in order to furnish and supply gas-fittings, cooking-stoves, fires, and engines, and all the various domestic labour-saving gas appliances, as a branch of the business. I have found it a great advantage to have such a department, with a show-room where all the best and most modern appliances for the economical use of gas may be seen and purchased at a reasonable trade profit. It is an absolute fact that nine-tenths of the complaints of bad gas, &c.,

arise from either defective fittings or else insufficient supply on account of the internal pipes being much too small, or antiquated burners being used which have done duty for many years. The small cost of replacing them would soon be amply repaid.

It appears time that a standard set of rules for gas-fitting work was issued, and adopted with the necessary local modifications, by the various gas companies and corporations, so that houses, &c., may be fitted up under authorized inspection, and unless the work is carried out in accordance with the regulations issued, the supply be not connected. Too long have the best minds in our profession devoted themselves unsparingly to reduce the cost of the gas at the meter—neglecting the equally important question of how to most efficiently use gas for light, heat, or power purposes by the consumer.

The expiration should be noted of the Welsbach master-patent in December last, which in 1885 was granted to Dr. Auer von Welsbach for the discovery of a practical and simple method of arranging certain refractory and rare earths so that a hood made of a fabric impregnated with a solution of these nitrates, when burnt away, left a skeleton of itself—the nitrates of the impregnated fluid being converted into oxides, and this hood on being heated to incandescence by a bunsen burner radiating light. This month, the Welsbach 1886 patent expires—being the one in which thoria is claimed. This leaves only the 1893 ceria patent; so that the field of competition will be widened, and we may shortly expect such reductions in the prices of gas-burners and mantles as will bring them within the reach of all consumers. The weak part of incandescent gas-burners is the mantle being so fragile, and its deterioration of lighting power after use for 100 hours and upwards. Also the light might be improved by the addition of more bright yellow and orange rays; but these disadvantages will no doubt in time be overcome, along with the abolition of the glass chimney.

I look forward to the time when self-lighting incandescent burners will come into general use; and I may mention, from experiments carried out by me, that there appears to be very little difference in illuminating power between 16 and 20 candle power gas when used with incandescent burners.

There is much to be said in favour of differential prices for gas; as it appears to me that the price charged should be in accordance with the service rendered. This means taking into account not only the quantity, but also the time during which it is used; so that those consumers who are the most profitable may have special consideration. Now, most gas undertakings charge different prices to quarterly and prepayment consumers, because the conditions of supply are not equal. In the latter case, additional expenses are incurred for fittings, &c., over quarterly consumers; and hence the increased charges for gas. Those, therefore, whose consumption is large during the day-time, or period of minimum demand, should be charged at a somewhat lower rate.

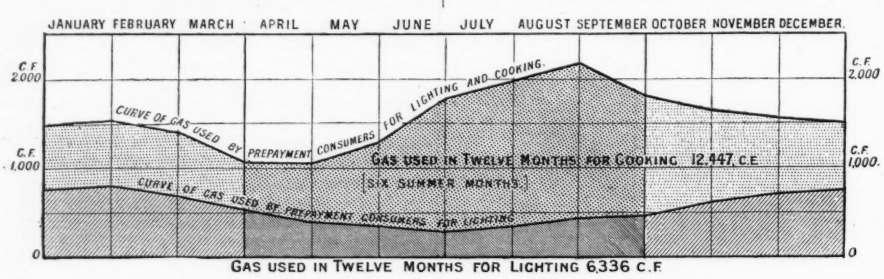
Referring to prepayment consumers, taking a large number with and without gas cooking-stoves, you will see from the diagram that those who have cooking-stoves use about three times as much per annum as those who use gas for lighting only; and, further (what is of more importance), the average gas consumption during the summer, where stoves are in use, is considerably over four times that where there are none. In the months of June, July, and August, when the demand for artificial light is comparatively small, those customers who have cooking-stoves use about six times the quantity of gas that those without do; and it is worthy of note that their maximum consumption is during these months.

An inspection of the diagram, giving the consumption each month, will show at once the advantage of affording every facility and encouragement to use gas cooking-stoves. It will be found that in houses of £20 rental, the quantity of gas used by cooking-stoves is about twice that used for lighting purposes; in houses of £30 rental, the quantity is about equal; and for houses of much higher rental, the relative quantity used for cooking as compared with lighting decreases to about one-half. But, of course, the figures in individual cases will vary considerably. The above are the averages obtained by separate metering of stoves.

TABLE *showing the Average Gas Consumption, for Each Month during the Year, of Prepayment Gas Consumers With and Without Gas Cooking-Stoves.*

1899.	With Gas Cooking-Stove. Cub. Ft.		Without Gas Cooking-Stove. Cub. Ft.
January	1,507	..	751
February	1,413	..	702
March	1,065	..	553
April	1,053	..	408
May	1,281	..	355
June	1,772	..	302
July	1,985	..	323
August	2,168	..	405
September	1,796	..	437
October	1,639	..	603
November	1,572	..	707
December	1,532	..	790
Total for the year	18,783	..	6336
Total used from the 1st of April to the 30th of September	10,055	..	2230
Total used from the 1st of October to the 31st of March	8,728	..	4106

In order to encourage the use of gas for cooking, heating, or motive power, we charge 4d. per 1000 cubic feet less than our ordinary price of gas used for illuminating purposes. This


JANUARY FEBRUARY MARCH APRIL MAY JUNE JULY AUGUST SEPTEMBER OCTOBER NOVEMBER DECEMBER.
C.F. 2,000
C.F. 1,000
0
CURVE OF GAS USED BY PREPAYMENT CONSUMERS FOR LIGHTING AND COOKING.
GAS USED IN TWELVE MONTHS FOR COOKING 12,447 C.F.
[SIX SUMMER MONTHS.]
CURVE OF GAS USED BY PREPAYMENT CONSUMERS FOR LIGHTING

GAS USED IN TWELVE MONTHS FOR LIGHTING 6,336 C.F.

brings the price down to from 2s. 3d. to 2s. 5d. per 1000 cubic feet, according to the quantity used; and if consumers agree to use 6000 cubic feet and upwards per quarter, we fix an additional meter free of charge. This small concession often induces consumers to have cooking-stoves and gas-fires fixed; and we find it an advantage for consumers to be able to accurately check the quantity used for lighting and heating purposes. The two accounts, when rendered at the quarter's end, enable them to do this, and ascertain the cost of each service.

One hears a good deal about the benefits to be conferred upon small industries when large central electric power schemes are established and are able to distribute electrical energy at 1d. per unit, or less when used for motive power. Without in any way deprecating the use of electricity for power (which has a great future before it), I may perhaps be allowed to point out that, in most districts, cheap power is already available. We are only waiting for users of power to avail themselves of one of the cheapest sources of energy—ordinary illuminating gas; the calorific value being, for 16-candle power coal gas, about 650 British thermal units per cubic foot. It may be conveniently utilized for power by means of gas-engines, which during the past few years have been greatly improved—chiefly in the direction of increased efficiency and size, rather than in the production of new types. At the present time, the consumption of gas per brake-horse power per hour, at full load, varies from 17 to 25 cubic feet, according to the size of the engine and the heating value of the gas used. The most modern make of medium-sized gas-engines (10 to 30 horse power) use about 20 cubic feet per brake-horse power; and this, at 2s. 3d. per 1000 cubic feet, means just over ½d. per brake-horse power per hour.

The most profitable consumers are those who use gas for motive power—the load-factor being nine hours per day, summer and winter, as compared with two hours per day in summer and six hours per day in winter when used for illuminating purposes. It will, therefore, pay gas suppliers well to make specially liberal concessions for the gas used for motive power, as not only have we electrical energy, which is now generally charged at one-half the lighting rate per unit if used for mechanical power, and for which it is specially adapted, but, in addition, there are oil, producer gas, and steam all competing. The three last-named perhaps are not, for small power, formidable competitors; but for larger power, unless the gas is sold when so used at about 2s. per 1000 cubic feet or less, they are much cheaper.

The present enhanced price of gas coals is due in a measure to advances in miners' wages and greater cost of all materials, but chiefly because at the present time the demand is greater than the supply. This being so, colliery owners have not hesitated to very considerably advance prices—unfortunately, to such an extent as to make the increase a very serious tax upon gas-works, and compel in many cases an advance in the price of gas. The long-continued rise in the price of coal shows no sign of declining; but further advances for this year's contracts are being discussed. A considerable additional rise in prices appears inevitable for some time to come. Unfortunately, the scarcity is such that gas-works have great difficulty in getting the necessary supplies; and the same applies to most industrial concerns where much fuel is required. If the scarcity continues, I think the export of coal should be taxed, as every ton sent abroad means so much decrease in our potential resources—more

especially as the export of coal has doubled during the last 25 years, and now reaches about one-fifth of the total output. The great scarcity, and consequent increase in prices, of all gas coals, will cause many engineers to look favourably upon carburetted water gas as an auxiliary; so colliery proprietors would do well not to raise prices to an inordinate extent.

During the last nine years, carburetted water-gas plants have been erected at upwards of fifty gas-works in the United Kingdom, and their total plant capacity is now about 100 million cubic feet per diem. According to the last Board of Trade returns, the total quantity of carburetted water gas sold in 1898 was 7404 million cubic feet, or just over 6 per cent. of the total gas sold. The figure for last year will, however, be considerably increased.

The Home Office inquiry that was held last year, to ascertain the suitability of water gas for general distribution in connection with coal gas, will be the means of allaying the fears of those—myself among the number—who somewhat doubted the suitability of the gas for general distribution on account of the much greater quantity of carbon monoxide present, as compared with coal gas. So far, no legislation has followed the report of the Departmental Committee, which at least shows the matter is not one of urgency. If legislation follows, no doubt a limit will be placed on the percentage of carbon monoxide permissible in the mixed gases; and the consensus of opinion seems to place this limit between 12 and 20 per cent. The recommendation of the Committee is to limit the proportion of carbon monoxide in the public gas supply at night to 12 per cent., or such greater amount as the Department may consider desirable.

It may be expected from me that, having the management of both gas and electricity works, I should say a few words on their respective provinces. Their attitude towards each other should be that of generous, and not hostile rivals; for there is more than room enough for both. In many towns, the municipality own both the gas and electricity undertakings, upon both of which large sums have been expended; and so a community of interests exists, which should not be ignored to the detriment of one or the other.

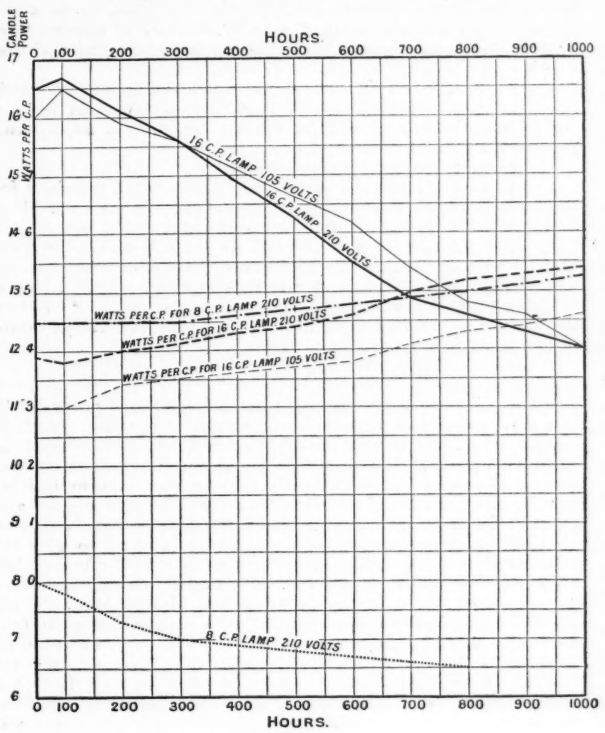
During the last few years, the electric light has made rapid strides; and we may expect this progress to continue, so far without being detrimental to the gas industry. A glance at the Board of Trade returns for the last five years will give some indication of the increase in the gas consumption over the same period. In the year 1898 (the last published returns), the total quantity of gas made was nearly 138¼ thousand million cubic feet, as compared with 114¼ thousand millions for the year 1894—being an increase of no less than 24 thousand millions, or over 21 per cent., during the last five years. In our own case, the electricity works have been running just over four years; and the increase in the gas consumption for the last nine months has been nearly 10 per cent. upon last year.

I am often asked how the cost of electricity compares with gas; but unless the exact conditions are known, it is almost impossible to give a correct estimate. For instance, gas may be used so as to develop 25 candles per cubic foot, or only 3 candles or even less per cubic foot. Again, electrical energy may be used in glow or arc lamps. Also there are high and low efficiency glow-lamps. So, unless the particular circumstances be taken into account, it is impossible to give an impartial estimate. The late Dr. John Hopkinson, F.R.S., was of opinion that generally if the price of electricity per Board of Trade unit be multiplied by 8, it would equal the price of gas, when efficient glow-lamps and good ordinary flat-flame burners are used. However, so that anyone may make his own calculations, I have plotted on a diagram the efficiency of 105 to 210 volts ordinary glow-lamps during their life of from 1 to 1000 hours.

During the next few years we shall see a very large increase in the use of electric energy for power, and especially for tramways by overhead conductors on the trolley system, with rail return; and it is of the utmost importance to those who have underground iron mains to see that the Board of Trade regulations for electric traction are strictly adhered to—more especially with reference to the difference of potential during the working of the tramway between the points of the uninsulated return furthest from and nearest to the generating station. This should not exceed a maximum drop of 7 volts. Also the line insulators of the feeders and conductors should be so maintained that the leakage currents shall not exceed 1·100th of an ampère per mile of tramway. Unless these conditions are closely observed, we shall have serious troubles caused by leakage currents affecting the neighbouring gas and water pipes by electrolytic action, which is singularly insidious—the effect being to render the pipes soft and spongy. In America, the gas and water companies have already experienced very serious trouble and heavy loss, through the rapid corrosion of their mains and service-pipes, due to the destructive effects of these stray currents by electrolytic corrosion; and considering the immense capital invested in underground gas-mains, and the dangerous effects that may result from the destruction of these pipes, it appears to me that all reasonable precautions against leakage should be adopted, and rigid inspections (along with careful tests) made from time to time, so as to minimize the danger. It is incumbent that we, on our part, do everything possible to keep our underground mains and services free from leakage; so that we may insist on all others who use the subsoil doing so without injury to their neighbours.

Allow me, in conclusion, to draw attention to what may be

Candle Power and Efficiency Curves of 8 and 16 Candle power, 105 and 210 Volt, Electric Glow-Lamps.



Arc lamps for a given energy show about six times the candle power of incandescent lamps.

A Board of Trade unit is 1000 volt-ampère-hours or 1000 watt hours. 10 ampères at 100 volts for one hour = One B.T. unit.

well known—that in the production of light by the combustion of coal gas, in which the hydrocarbons are raised to incandescence, a large amount of heat is generated, only a small proportion of which is utilized in the production of light. By heating to incandescence a mantle composed of certain refractory and rare earths, we obtain a somewhat higher efficiency; but a comparison between the energy required to fully incandesce a 16-candle power electric glow-lamp (which may be taken at 60 watts, or in heat energy about 200 British thermal units), and to maintain a 16-candle power gas-lamp, using an incandescent burner developing 16 candles per cubic foot, required about 650 British thermal units, or more than three times the heat-energy expended in maintaining an electric glow-lamp. This shows the possibilities of incandescent lighting by means of gas-burners. Especially remembering that Dr. Siemens estimated that in arc lamps of 3000-candle power one-third of the energy became luminous, and that incandescent glow-lamps utilize only about 5 per cent., he would be rash who prescribed a limit to the progress that is being made in the development of converting heat energy into light; and I look forward to the overcoming of the chemical and mechanical difficulties for the accomplishment of very much higher illuminating efficiency per cubic foot of gas used.

I have touched lightly—perhaps in too general a way—upon various topics that seemed likely to be of interest; and I trust you will not deem the time occupied as unprofitably spent.

At the conclusion of the address,

Mr. Charles Hunt (Birmingham) congratulated the President upon having produced such an interesting address. He hoped that the aspirations he had indulged in, at the commencement of it, as to the fusion of the Gas Institute and the Institution of Gas Engineers, might be fulfilled. He also congratulated him upon his Corporation having been the first among corporations to adopt the profit-sharing system, and upon the success of his initiative. They were not permitted to discuss the matter contained in the President's address; and he (Mr. Hunt) was not going in the least to transgress this wholesome rule. He wished, however, to observe on one point that he was entirely in accord with Mr. Bell in his opinion as to the effect of condensation upon the reduction of naphthalene; and this was no new opinion of his own. He gave it fully ten years ago; and, later than that, he mentioned the same thing in the paper he read before the Institution of Civil Engineers. He did not regard condensation as the thing to be aimed at—he regarded it more as a cure for naphthalene rather than the prevention. It seemed to him they should aim at prevention quite as much as a cure. But where the conditions were such as to produce naphthalene in the retorts, then he entirely agreed with the President that efficient condensation was a practical cure. He was glad to say that quite recently it had been decided

that he should try to put his opinions into practice; and he hoped that good results would follow. There were other matters in the President's address that he did not quite agree with; but putting them aside, he was sure all were of opinion that their hearty thanks were due to him for his intelligent address, which would be read with interest when printed.

Mr. W. R. COOPER (Banbury) seconded the proposition with much pleasure. He remarked that the address had been a most instructive one; and he wished Mr. Bell a happy and prosperous year of office.

The proposition was cordially agreed to.

The PRESIDENT said he was much obliged to the members for the hearty way in which they had received the address. If it had interested them, he might say it had interested him also in preparing it; and he was pleased to know it met with some amount of approval. They would now pass to the next business, which was the discussion on the paper read by Mr. G. Helps, at the last meeting, on "The Heating of Gas-Retorts."* Before the discussion commenced, however, perhaps Mr. Helps would like to say a few words.

THE HEATING OF GAS-RETORTS.

Mr. G. HELPS (Nuneaton) said he did not come prepared to give a *résumé* of the paper which he read at the last meeting; but he would try to put before the members briefly what he wished to prove. His propositions were: (1) That there was no real advantage to be gained in fuel consumption by heating the primary or secondary air with so-called waste gases; and (2) that all the advantages claimed for regeneration could be obtained by generator settings. He endeavoured to give the grounds for these propositions, which were that the theoretical advantage in favour of regeneration, under perfect conditions, could only be about 20 per cent. on the fuel account. These perfect conditions would mean that the whole of the waste heat was capable of utilization, and that no direct heat was used for heating up the secondary air, and also that there was not the slightest short-circuiting between the secondary-air flues and the waste gases. He thought it would be conceded that these conditions were impossible of realization with recuperators; whereas they could be more nearly obtained with ordinary generators, where the secondary air was almost entirely heated by direct conduction. With coal giving 13 cwt. of coke per ton, the small theoretical advantage would only be ½ cwt. of coke per ton of coal carbonized in favour of recuperation; and this must be somewhat reduced in practice, if not altogether lost. With regard to the results obtained in practice by simple generators, he had not personally had any very great experience; but in the paper read by Mr. C. C. Carpenter before the Southern Association in 1886, to which he (Mr. Helps) alluded in his paper, reference was made to a very elaborate test which the author had undertaken to prove that the advantage in favour of recuperation was very small—that it came out to less than 1 lb. of coke per 100 lbs. of coal carbonized, which would be about 13·39 per cent. of the total fuel, taking the coal he used as giving 15 cwt. of coke per ton. In his (Mr. Helps's) paper, he also had drawn attention to the fact that Mr. Carpenter was selling from Newcastle coal 10¾ cwt. of coke and 1¼ cwt. of breeze, which made a total of 11¾ cwt. of coke and breeze sold per ton of coal carbonized. This, on the same basis, would work out to about 10·62 lbs. per 100 lbs. of coal carbonized. Again, and this entirely accorded with his contention, he (Mr. Helps) knew of several works with shallow generators, and settings of six small retorts, where just upon 10 cwt. of coke was sold per ton of mixed coal —half Staffordshire and half Yorkshire. In addition to this, he took his own tests, as given in the paper. These extended over some time, and with several different settings; and they tended to prove his propositions were correct. If there was no difference in the fuel account of two settings, one having the division-wall between the waste gases and the secondary-air flues ⅞ inch thick, and three times the area of the division-wall of the other set, which was 4½ inches thick, surely it must point to one of two conclusions: Either (1) that there was a lot more waste heat in the regenerator with the thin wall of large area than was required to heat the secondary air, or (2) that the quantity of really waste heat entering the recuperator that could be utilized by the secondary air was a very small matter indeed. If the former conclusion were correct, the heating of the primary air to 1500°, as well as the secondary air, should have made some difference in the fuel account. As it did not do so, the only inference he could draw was that there was very little waste heat available for heating the secondary air in the recuperator under proper conditions of damper adjustment, &c. Under theoretically perfect conditions, and conceding to recuperation more than its due, it was clear that the difference in the fuel account could only be between 28 and 56 lbs. per ton of coal carbonized; and a very little defect in the working, or in the recuperator itself, would counteract this. He was of opinion that the extra expenditure necessary to heat the secondary air by waste heat, instead of direct heat, could not be justified.

The PRESIDENT said the members had heard the few remarks by Mr. Helps with reference to his paper. He had enunciated the proposition (which the members ought to be able to discuss) that no real advantage was to be gained in heating the primary and secondary air supply over that obtained in practice with ordinary generator furnaces. He (the President) did not propose to enter into the discussion himself; but he might say that the proposition did not agree with his own practice. He found that there was considerable advantage; and he should like to hear an expression of opinion on the subject from various members.

Mr. HENRY HACK (Birmingham) said that, after carefully reading Mr. Helps's "Notes" on this subject, he had seen nothing whatever to lead him to change the opinion he expressed at the last meeting. The author's proposition was altogether contrary to his own experience; and he had had a large experience in regenerative furnaces. He noted that Mr. Helps had discarded altogether the question of ordinary furnaces; and therefore the whole thing resolved itself into a question whether it was beneficial and economical to go to the expense of heating the primary air as well as the secondary air. He (Mr. Hack) had lately looked up tests that he had made in past years on various furnaces at his works, and the results there showed that there was considerable benefit in heating the secondary air, and also a further benefit by heating the primary air. Even if the saving in fuel was small, it was an advantage, and was worthy of adoption. With regard to the claims 1 to 4 propounded in the paper, he thought it would be a feather in the cap of Mr. Helps if he proved his case; but he was afraid he would have a hard job to do it. To his (Mr. Hack's) mind it was a prominent case of Theory *v.* Practice—a lot of the former, and comparatively little of the latter; for Mr. Helps candidly told them that some of the practical tests he had intended to make at Hinckley had to be abandoned by him on his leaving those works. It would, however, be interesting to know whether his successor took up the matter; and, if so, whether he would let them have the results from the furnaces with which Mr. Helps started his experiments. He (Mr. Hack) had often protested, and he protested now, against the method adopted for arriving at the fuel consumption—that was, the method of stating the coke and breeze sold per ton of coal carbonized. There were various things that cropped up in the method of dealing with the coke—the screening, and so on—which would affect the result. His opinion was that the only satisfactory way of getting the true results was to take settings for a week or a longer period, and actually weigh in the coke and the coal—letting the coal be of the same quality in all the tests made—and then see what the percentage of coke used was to the coal carbonized. He repeated that stating the coke sold per ton of coal was misleading altogether; and it was a method he should never adopt himself. Looking through the author's "Notes," he might say that he regarded them as a good theoretical exposition; and, as they stood, he could find no fault whatever with the figures given. But he thought Mr. Helps had overlooked the fact that the specific heats of gases varied with the temperature, and that he had taken the specific heats at ordinary temperatures. He (Mr. Hack) was told by one who had studied the matter more than he had done himself, that at 4000° Fahr., the specific heat was at least double; consequently the temperature of combustion was very much lower. Therefore, the calculations that Mr. Helps had put before them should, he thought, be corrected to the specific heats of the gases at the different points in the settings where he dealt with them, and not at ordinary temperatures. He was convinced most strongly that Mr. Helps was wrong in his conclusions; and he did not simply assert this, but he was backed up by his own numerous experiments at his own works. This was a case to which they might apply the statement that a pound of practice was worth about 10,000 units of theory. (Laughter.)

Mr. THOMAS GLOVER (West Bromwich) said he remembered some time ago watching what Mr. Helps was doing; and he persuaded him at that time to promise to give a paper to the Association embodying the results of his experiments. He was not, however, prepared for the right-about-face attitude which Mr. Helps had taken in his paper. At that time he was enthusiastic about recuperation; but when Mr. Helps's "Notes" came out, he found he had discarded it altogether. It seemed to him (Mr. Glover), when reading the paper, that Mr. Helps had started by trying to eat his cake and to have it at the same time, and yet he finished off by throwing the cake away. The previous night he (Mr. Glover) had spent one or two fairly stiff hours over the paper; and, in going through the calculations, he fancied he took them in rather a different way to the author He took the fuel consumption for a setting from actual experience, and worked it out, on Mr. Helps's data as to the weight of air required for the secondary combustion, and the units of heat absorbed in heating the secondary air up to 2000°. Using his data, a theoretical saving was shown for recuperation of 20 per cent. over generators. They knew this was a figure that did not at all come out in practice; and therefore he should be inclined to agree with what Mr. Hack had suggested, that there was something wanting or not quite correct in the paper, or the figure would come out nearer actual practice. There was a saving, but it did not work out to 20 per cent. for regenerators as compared with generators. But there was a saving; and he had had ample opportunities for testing it. He had a distinct liking for a simple generator furnace; but he was bound to say there was a saving in the use of regenerators. To tell the truth about the matter, regenerators would use as fuel 20 per cent. of the coke made; and with simple generator heating, 24 to 25 per cent. would be used—showing a saving of from 4 to 5 per cent. in favour of regeneration. Now it seemed to him to be a question for consideration whether the capital expenditure

* See "JOURNAL," Vol. LXXIV., p. 1055.

was not out of all proportion to the saving effected. He took a regenerator setting of 16 mouthpieces at £40 per mouthpiece, which equalled £640. He assumed that a generator setting, without recuperation, could be built for £25 per mouthpiece. This would come out to £400 per setting. Now taking 273 working days per year, and a coal consumption of 2730 tons, he found that the saving in coke for regenerators as compared with generators would be 68 tons. If they took this at 10s. per ton, it worked out to £34 for one setting. If they then took 10 per cent. (£24) on the difference in cost for installing generators and regenerators, they had a saving of £10 per set per year for regenerators as compared with generators. This was how he had been bound to look at the question. He had both generators and regenerators working side by side at his works; and so he had had ample opportunities for testing the matter. What he had therefore stated was his actual experience; and he was not in entire agreement with Mr. Helps when he stated that no real advantage was to be gained in fuel consumption by heating the secondary air with the so-called waste gases, nor that all the advantages claimed for recuperation could be obtained by generation. He (Mr. Glover) quite admired Mr. Carpenter's arrangement, and thought his furnace practice excellent. But he did not agree that the best method of heating retorts, horizontal or inclined, was by having one producer for several beds, except in large works. It might be the best for the South Metropolitan Gas-Works; but he did not think it was capable of universal application. Mr. Helps asked the question in his paper, "What can truly be designated waste gases in this connection?" The waste gases were those that left the bottom retort, and either entered the main flue or passed into the regenerators. He (Mr. Glover) should say that the waste gases were carbonic acid, nitrogen, and a very slight excess of oxygen. If the gases were tested there, and about 0·05 of oxygen were found, then they knew that all the carbonic oxide was burnt, and the best results were being obtained. It was not a very elaborate experiment to find out the composition of the gases at this point; and it was a most useful guide in proportioning the primary and secondary air—if there was a very slight excess of oxygen present, the whole of the carbonic oxide was being burnt. He thought he had said enough to show that, while he believed what Mr. Helps had said, that the bulk of the advantages might be obtained by a good generator, there were other advantages over and above those obtained by a generator that could be obtained by a regenerator.

Mr. CHARLES HUNT (Birmingham), on being called upon by the President, said that Mr. Glover had clearly put before them the difference in fuel economy between generators and regenerators; and he did not think he could add anything to what had been said on this point. He quite agreed with Mr. Glover that, to a large extent, the advantages of gaseous firing were secured by the simpler arrangement; but the full advantages could only be obtained by recuperation, more or less elaborate. There was, however, one point that was generally missed in the discussion of this question. He did not see that fuel economy was the one thing by which the merits of a system were to be determined. Their aim was to provide themselves with an efficient furnace to suit their own circumstances. Which then was the most efficient furnace—that in which recuperation was employed to its fullest extent, or that in which the generator was the prominent feature? Very early in his study of this subject, he had tried both, and had to give up the latter. He had applied Mr. Carpenter's plan to his setting of nine retorts—heating two from one generator; and it was not successful. He could not properly heat their settings with it, and had to return to the so-called elaborate regenerative arrangement. Probably the reason why Mr. Carpenter succeeded where others might fail was to be found in the setting itself. Mr. Carpenter's original setting was one of six retorts, arranged in two vertical rows, with a fairly wide space between them. This gave plenty of room for slow combustion, and the secondary air became heated up in the bed itself. But where the retorts were packed more closely, there was little opportunity for this to take place. The work of heating up the air must be done, either below the setting, or within the latter. If below, they were able to heat more retorts in the same area. The alternative to this was to increase the number of tiers of retorts, as was done at the South Metropolitan Gas-Works, where a setting of ten retorts arranged in five tiers had now been generally adopted. He did not doubt the economy of this setting, but it did not seem to him to be so convenient as one in which the whole of the retorts could be worked from the same stage or floor. He himself preferred a setting of not more than three tiers, and although the retorts might in that case have to be placed closer together, so as to economize space, he regarded this as a matter of more importance, although seldom referred to in discussions of this kind. The question generally turned upon how many pounds of fuel could be saved by a particular furnace. But they wanted an efficient furnace; and the most efficient furnace was that which was adaptable to the greatest variety of conditions and requirements. This, in his opinion, was an accurate description of the regenerative system which was now so largely employed.

Mr. B. W. SMITH (Smethwick) said he had not had the experience with generators that Mr. Hunt had; but he could judge pretty well, compared with the regenerator furnace, as to their duty power. He quite agreed with what Mr. Hunt had said, that it was a most essential thing for them to obtain an efficient heater, or to obtain the greatest duty power irrespective of the small extra cost likely to occur in the lower furnace. Now with regard to the fuel account, that was a very sore point with him. He had had many contentions as to the amount of fuel he used, or the amount of fuel that somebody else used as compared with himself. He thought it was a great mistake for anybody to attempt to give a statement as to the amount of fuel used, because it varied in accordance with the quality of the coal, the amount of coke that had to be stacked during the winter, as well as the method employed in handling the coke from the retorts. These were three very important factors. If he had not to stack a large quantity of coke, his fuel account would be reduced considerably. It was not fair to take the amount of fuel based upon the amount of coke sold.

Mr. T. BERRIDGE (Leamington) said he would suggest that a small Committee be formed to go to Nuneaton and inspect the settings which he understood were about to be built, and make a practical trial of them. They could only come there and talk of their personal experience; but if they had a Committee of two or three gentlemen, who could go and see what was actually being done at Nuneaton, they could report to a meeting. A great deal more good would be derived from this than by giving their individual oinions. He moved that a small Committee be formed for this purpose.

The PRESIDENT remarked that they had had a most interesting and instructive discussion; and they were much obliged to Mr. Helps for having brought this question forward, though the bulk of the members did not agree with his deductions. There was a great deal in what Mr. Hunt had said with reference to the number of retorts in a bed. Mr. Carpenter had worked with ten retorts; while probably all the members of the Association worked with six, seven, or eight, and perhaps some of them with nine. Another speaker pointed out that the quality of the coal and the method of handling the coke should be considered. If conveyors were used, the coke was broken much less, and less breeze was made. All these were points that were worthy of attention in discussing this question. Personally he found that modern regeneration was an advantage.

Mr. HELPS, in reply, said Mr. Hack had made some remarks with regard to the paper containing a great deal of theory that was not backed up with much practice. But he should like to ask Mr. Hack whether he correctly understood him in regard to the heating of the secondary air. In some of his remarks, he thought Mr. Hack assumed that he did not favour the heating of the secondary air in the case of generator furnaces. It was just the contrary; he was strongly in favour of heating the secondary air as much as was possible.

Mr. HACK said he clearly understood from Mr. Helps's paper that he did not approve of the secondary air being heated by the waste gases, but by radiation or conduction.

Mr. HELPS (proceeding) said Mr. Hack stated that he felt sure he (Mr. Helps) was wrong, and that his statements were all based on theory; but with all deference, he should like to point out that Mr. Hack did not favour him by telling him where he was wrong. When he submitted his "Notes" to the members, he distinctly stated that they were written with the object of obtaining information; and if anyone would tell him where he was wrong, he should be particularly obliged to him. Certainly at the present time he could not himself see where it was. Mr. Hack told them that he had made several tests; but he did not give them any indication of the line he took in making them. In the paper, he (Mr. Helps) suggested certain definite lines on which, in his opinion, tests should be made; and if Mr. Hack had made tests on these lines, and would say that he had proved that recuperation was an advantage, then he should have no doubt that Mr. Hack was right.

Mr. HACK remarked that he had made tests on proper lines; and it was upon these tests that he based the statement that he found the heating of the secondary and primary air was an advantage.

Mr. HELPS: Can Mr. Hack say what the advantage was?

Mr. HACK said he mentioned in his remarks that the advantage of heating the secondary air was considerable, and there was a further advantage, but not to the same extent, with regard to the primary air.

Mr. HELPS said that all he was anxious to know was where he was wrong; and he would give in immediately if anyone could show him. But he was a bad one to acknowledge he was in the wrong, until someone proved that he was. Perhaps Mr. Hack would tell him why he did not secure any advantage when he heated up the primary air, as well as the secondary air. He had heated it up to considerably over 1500°; but he found he did not get the slightest advantage from it. This was where he came to a stop. He could not at all see why there should not be an advantage in heating up the primary air if an advantage could be obtained by heating up the secondary air. He tested the matter for seven or eight months; and he arranged the setting so that he could heat up both the primary and secondary air at the same time, or separately. This was the test he referred to in the paper. With regard to the correction which it was stated should be made in connection with the temperature of the gases, that was no doubt quite correct; but he did not think the correction was necessary. It would not amount to a great deal even if made; and the lines of the argument would not be the least affected. He quite agreed with Mr. Hack that a pound of practice was worth 10,000 units of theory. And in his paper he thought he had given the pound of practice; in

other words, he had endeavoured to set forth in it only what he had actually done, and had not assumed all kinds of things. Mr. Glover got somewhat nearer his ideas than Mr. Hack had done, but not very much. Mr. Glover thought there was a difference of 4 or 5 per cent. This was on the right road; and if he would really put the matter to the test, he would find that it was very easy to lose this 4 or 5 per cent. under imperfect or ordinary working conditions. Mr. Glover, like many others, had not made a test under any special conditions to arrive at the conclusion he had formed.

Mr. GLOVER: My tests were made under ordinary conditions.

Mr. HELPS: In my paper, I set out certain conditions that are absolutely necessary for arriving at correct results.

Mr. GLOVER: I regard everyday work as the best possible condition that one can get, if the settings are exactly alike from week to week.

Mr. HELPS: The settings must all be constructed on exactly the same lines.

Mr. GLOVER: I give way on that point.

Mr. HELPS: If there is (say) a ton of bricks in one setting, and only ½ ton in another, there will be a lot of difference in the fuel account. Mr. Glover says I am wrong; but he has not shown me where.

Mr. GLOVER: I have left that for another occasion. (Laughter.)

Mr. HELPS (continuing) said Mr. Hunt had remarked that fuel economy was not everything; and he (Mr. Helps) was quite in accord with this observation, because there was so little difference in the fuel account between a generator and an ordinary regenerator that he did not think it worth consideration. He did not know whether Mr. Hunt, when he made his tests, heated the secondary air to any great extent, because he (Mr. Helps) found that generally a comparison was made with a generator in which the secondary air was only heated to a low temperature with a regenerator in which the air was heated to a high temperature. Of course, in such a case the comparison was not on proper lines. Although Mr. Hunt had kindly made some remarks, he, like the other speakers, had not shown him where he was wrong. (Laughter.)

Mr. HUNT: I have not really read the paper.

Mr. HELPS was sorry that Mr. Hunt had not. Mr. Smith had touched upon the question of the fuel used, and said he considered it was not a good method to base the fuel consumption on the amount of coke that was sold. They all knew the difficulties there were in the way of making a reliable comparison between the fuel accounts at different works. Some people adopted the system of stating the fuel account per 100 lbs. of coal carbonized; but this could be made to suit the fancy of anyone. One had only to "adjust" the quantity of coke made from a ton of the coal he was using, and the thing was done. It seemed to him that the coke sold per ton of coal over twelve months was a fairly reliable method. [No, no.]

Mr. SMITH: Stack 2000 tons, and you will see.

Mr. HELPS said it appealed to him as being the most reliable method, although even then there were many different circumstances. For instance, one works might sell all the coke forked, and not take into account the breeze. Another might sell all the coke by shovel; and even the clinker ashes from the fires were sometimes weighed out, and credited to the fuel account. Again the coke made from a ton of coal was generally taken as weighed hot; and the coke sold per ton of coal was the coke after it had been quenched. They knew that, if coke was weighed and sold just after quenching, it had fully 15 per cent. of moisture in it; but after it had been stacked some time, it was supposed to retain only about 3 per cent. So that those people who sold the coke as it was made, had a distinct advantage over those who had to stack it. These varying circumstances alone—and there were plenty of others—made it, to his mind, almost impossible to discover the 28 or 56 lbs. per ton of coal carbonized advantage, one way or the other, with the regenerator setting over the generator, or *vice versâ*. Most of the members seemed to think there was no doubt whatever that recuperation was the very best thing, and that ordinary generation was "not in it;" but he did not gather that any specific tests had been made of this matter. However, considering the enormous expenditure incurred in the adoption of recuperator furnaces over and above that required for ordinary generator settings, would it not be well, he asked, for the members of the Association to thoroughly investigate the matter, and for a Committee to make systematic tests. It appeared to him that such a test would be far more reliable than any number made by individuals. If this suggestion should meet with the approval of the members, his Directors permitted him to offer, on their behalf, three arches, in which could be set three beds in such a manner as a Committee of the Association approved. It occurred to him that two of the beds might be fired from one generator, and the other by any recuperator the members might wish. In this way, a thorough test of the matter might be made. If the Association could favourably entertain this offer, he trusted it would prove conclusively the relative value of the two systems. He could not say that the discussion had altered his convictions one bit. However, he trusted that the remarks he had perhaps somewhat bluntly made in his reply would not be misunderstood.

The PRESIDENT said they were indebted to Mr. Helps for bringing this paper before the members, and for giving them his opinion. It was only by difference of opinion that they arrived at the truth of the matter. He did not know what the members thought of the suggestion Mr. Helps had made, to put three arches at their disposal for the purpose of testing the question. It seemed to him the matter required some consideration before they committed themselves to proceed with it. Most of the members had made the subject one of experiment; and some of them had carried out somewhat extensive experiments. He did not therefore know that the matter would be forwarded by conducting an investigation with the three settings as proposed.

Mr. HELPS remarked that they had these three arches empty at the present time, and they would have to put three settings into them under any circumstances; and as his Directors had kindly offered to put in, at their own expense, such settings as might be considered by a Committee best calculated to prove the question—which he considered still at issue—he thought it a very favourable opportunity to carry out such a test as he had indicated.

Mr. T. BERRIDGE (Leamington) considered the suggestion a very good one. They had often thought about experimental work; and now that they had an opportunity to do something in this direction, it ought not to be thrown away. He, therefore, moved that the offer be accepted.

Mr. HUNT suggested that it should be referred to the Committee for consideration.

Mr. A. COOKE (Oldbury) seconded Mr. Berridge's proposition, and Mr. W. NORTH (Stourbridge) that of Mr. Hunt.

On being put to the vote, the amendment was carried.

[Since the meeting, Mr. Helps has forwarded for publication a few supplementary comments on a point which he overlooked in his reply upon the discussion. He writes: "Mr. Hunt made some remarks as to the particular setting adopted by Mr. Carpenter, stating that such a setting—two tiers of five retorts each—was not applicable to many works; that most engineers, owing to structural conditions, had to set their retorts in beds of eight or nine, in three tiers; and that a regenerative furnace for heating such had especial advantages over an ordinary generator. Mr. Hunt further said that Mr. Carpenter's setting gave him a distinct fuel advantage on account of the combustion space he had. I should like to be allowed to remark, that I quite admit there is a fuel advantage in having only two tiers of retorts in a bed, whether they are two tiers of threes, fours, or fives, as such settings are the simplest, and offer most facilities for heating; cramping and local heating being avoided. Plenty of combustion head-space being essential for an even and economical distribution of heat, settings of three tiers cannot be favourably compared with them. One great advantage, however, of Mr. Carpenter's system is that, by his arrangements, he thoroughly mixes all the gases from his producer before the second combustion takes place; whereas in ordinary recuperative settings you have producer gases of varying quality from the front to the back of the setting. The thorough mixing of producer gases effects a very considerable saving in fuel—a fact which it is important should be borne in mind in this discussion, as by Mr. Carpenter's system the gases are mixed by the very manner of their distribution; whereas to mix them in an ordinary recuperative setting is a very elaborate business. No doubt, Mr. Hunt is fully aware of this advantage; but as there are some members of the Association who might overlook it, I have ventured to call attention to it."]

THE INCLINED RETORTS AT SMETHWICK.*

The PRESIDENT said the next item on the *agenda* was the discussion of Mr. B. W. Smith's paper on "Inclined Retorts," which was also read at the last meeting. Perhaps Mr. Smith would like to make a few remarks before the discussion commenced. After the paper was read on the last occasion, a number of the members had the pleasure of seeing the very excellent installation at Smethwick. They took advantage of the opportunity to ask Mr. Smith a number of questions during the inspection; and they were answered in the most satisfactory manner. For himself, he could only say that the installation was one of the best and most complete that he had yet had the pleasure of inspecting.

Mr. B. W. SMITH (Smethwick) said he could only repeat the great pleasure it had afforded him to have the members visit his works to see the little he had been doing in the way of improvement. He could add nothing further to the remarks he made in his paper; but he should be pleased to answer any question upon any point in connection with the installation that might have cropped up in the minds of members since their visit. The inclined retorts had been working continuously from the time they were started; and there had been no interruption or mishap, or anything to cause them to regret the step they took in adopting the system.

Mr. T. GLOVER (West Bromwich) said he thought they discussed Mr. Smith's paper very well on the spot; and they felt at the time that it was the best place to discuss it. He believed Mr. Smith went to a lot of trouble in explaining the method of working, and the construction of the inclined retort settings, to the members individually; and they came away from Smethwick feeling that they had seen a good installation, and many of them understood considerably more about inclined retorts than they

*See "JOURNAL," Vol. LXXIV., p. 1057.

had done hitherto. Therefore, he did not think there was a great deal they could now say. They admired very much the way the work had been done; and they admired the way the retorts were behaving themselves now they were at work. The installation reflected credit on Mr. Smith's design, on his choice of contractors, and on the way in which the latter had done their work.

Mr. H. Hack (Birmingham) said it was his misfortune not to have been able to visit the Smethwick works with the members; but through the kindness of Mr. Smith, he had had the opportunity of seeing the installation since then. He had great pleasure in supporting the statement made by Mr. Paterson in the course of the proceedings, that this was one of the finest installations of inclined retorts—it was second to none, possibly even in regard to Salford. For a very considerable time he (Mr. Hack) had his doubts as to the working of inclined retorts; and it was only on seeing the splendid installation at Salford, that he recommended his Committee to put up such an enormous installation as they were erecting at Saltley. Since then, he had not at all lost faith in the system; but he had been much encouraged by what he saw at Smethwick. The heats—he believed the settings were on the regenerative system, with both the primary and secondary air heated (laughter, in which Mr. Helps joined)—were uniform throughout; nothing could have been better. Then with regard to the coke. In some places, when first starting these inclined retort installations, they had noticed trouble in getting out the coke; but in this case he observed, as he also did at Salford, that, simply with one touch of the bar, the coke came out beautifully. When Mr. Smith started his coke-conveyor, he thought the installation—taking the retorts and conveyor together—would be second to none in the kingdom. He took this opportunity of publicly offering his congratulations to Mr. Smith on his successful installation. There was one other point. Mr. Smith had no hydraulic main in this installation. He (Mr. Hack) had not yet gone quite so far as that; and he was a little anxious about it. A good many managers, he knew, had done away with hydraulic mains, and were getting splendid results; but he as yet was fearful of doing away with them. However, he was open to conviction that it was the right thing to do.

Mr. H. P. Maybury (Great Malvern) wished to join in the expression of congratulation to Mr. Smith. He might say that what he saw of the installation before it was lighted up, and subsequently, had led him to adopt the same principle.

Votes of Thanks.

The President thought the members could not separate without giving expression to their thanks to Mr. Helps for his interesting paper, and also to Mr. Smith for his contribution to the proceedings. They had had a very instructive discussion; and he had to propose that the best thanks of the members be accorded to both Mr. Helps and Mr. Smith.

Mr. J. Gould (Stourport) seconded the motion.

Mr. Helps, in acknowledging the vote, said he felt somewhat for the members in having to listen to his discursive remarks that afternoon. If some other gentleman who was more capable than he was of expressing himself, had had the *facts* which he had at his (Mr. Helps's) disposal, he would, no doubt, have been able to handle them in a better way, and have convinced every member present that they were right. (Laughter.)

Mr. Smith, in also acknowledging the vote, said it had afforded him, as it had always done in the past, great pleasure in contributing a small matter of interest to the Association. His duties did not permit him to devote so much time to preparing papers as some other members were able to do. Still there was the satisfaction of knowing that, however hard one had to work, it was a recreation to treat upon subjects which imparted information to others, and in knowing that, in doing so, the thanks of such an Association as this had been earned and received.

The Association Reports.

The action of the Committee in sending to each member a copy of the volume of the "District Association Reports for 1899" was confirmed.

Deceased Members.

The President remarked that, with reference to the members whom the Association had unfortunately lost by death during the year, a vote of condolence was passed by the Committee; and he would ask the Secretary to state what had been done in the matter.

The Hon. Secretary said he did not know that he had anything to say, beyond the fact that votes of condolence were conveyed to the families of the deceased members, and that he had replies acknowledging the same, except in the case of Mr. Parsons. In this instance, the matter was somehow unfortunately overlooked; the death of Mr. Parsons having occurred in the early part of the year.

This ended the business before the meeting; and the members subsequently had high-tea together.

The Bakerian Lecture of the Royal Society will be delivered next Thursday, by Professor Tilden, F.R.S., on "The Specific Heat of Metals, and the Relation of Specific Heat to Atomic Weight."

SOUTHERN DISTRICT ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Annual Meeting of this Association was held last Thursday, at the Holborn Restaurant. At the commencement of the proceedings,

Mr. A. E. Broadberry (Tottenham), the retiring President, said his duty that afternoon was of a very simple character; but it was fraught on his part with a certain amount of sorrow, involving as it did his vacation of the chair. He felt that during his presidency of the Association he had left undone a good many things he had hoped to have done. On the other hand, it afforded him a great deal of pleasure to instal his friend Mr. D. Irving. It needed no words of his to introduce or recommend Mr. Irving to the members; he was already well known and highly appreciated by them. For the past 25 years, the Association had held an important position and done good work. He was sure they all united in wishing Mr. Irving a good year of office, and in hoping that the Association, under his care, would continue to flourish as it had done in the past.

Mr. Irving then took the chair, and was cordially received by the members.

The minutes of the previous meeting were next confirmed.

Annual Report of the Committee.

The Hon. Secretary (Mr. J. W. Helps, of Croydon) read the annual report of the Committee, which was as follows:—

The Committee have pleasure in presenting their twenty-fifth annual report on the working of the Association during the presidency of Mr. A. E. Broadberry.

They regret that during the year four members have been removed by death—viz., Messrs. F. Livesey, W. H. H. Broadberry, H. Legg, and W. Faulkner. Mr. F. Livesey, although frequently invited to do so, never occupied any prominent official position in the Association. He was, however, for many years a regular attendant at the meetings, and freely contributed both to the reading of papers and to their subsequent discussion. Mr. W. H. H. Broadberry was one of the original members of the Association, and in the year 1881 occupied the presidential chair. Mr. H. Legg was elected a member in the year 1899; while Mr. Faulkner joined the Association on its amalgamation with the South-Western District Association.

These losses, together with the resignation of three members, and the removal of two others under Rule 20, represent a total decrease of nine, and as only six new members have been added during the year, the present number of members upon the list has been reduced from 155 to 152.

The Committee regret that the attendance at the various meetings has not been as satisfactory as they have a reasonable right to expect, considering the number of members belonging to the Association. They desire, therefore, to emphasize the importance of special efforts being made to attend, as they feel certain that the papers and discussions, and the means afforded for the mutual interchange of ideas, cannot fail to be of advantage to the members and to the companies they represent.

The finances of the Association are in a prosperous condition. Commencing the year with a balance of £92 6s. 11d., the receipts have been £79 16s.; and the expenses, including £36 15s. expended on presentation copies of the "Reports of the District Associations," amounted to £64 11s. 7d. —leaving a balance to carry forward of £107 11s. 4d.

The Committee, in conclusion, earnestly request that members will do all in their power to support their President, and to assist the Honorary Secretary and Committee, by regular attendance, by contributing papers, and by taking their fair share in the discussions which follow.

On the motion of Mr. F. E. Linging (London), seconded by Mr. T. A. Guyatt (Ely), the report was adopted.

Contribution to the Transvaal War Fund.

The Hon. Secretary said there was one other matter he would like to bring forward. The members would have seen from the report of the Committee which he had just read that the funds of the Association were in a particularly prosperous state. There was a balance of more than £107 to carry forward. He was sure that all the members present felt in a very happy frame of mind, on account of the good news that had just reached them from the seat of war. He did not know whether they would be acting *ultra vires*, but he thought it would be the wish of every member that they should show their gratitude for the blessing vouchsafed to them by the great victory that had been achieved, by doing a little to alleviate the sufferings of those who had been afflicted through the war. If they had power to do it, he would propose that the sum of ten guineas be sent by the Association to the Lord Mayor's fund.

Mr. J. D. Ashworth (Portsmouth) seconded the motion.

The President said he did not know how they could better show their appreciation of the good news just received than by contributing from their very large balance towards the object named.

The proposition was carried unanimously.

Thanks to the Ex-President.

The President proposed that the very best thanks of the Association be given to Mr. A. E. Broadberry for his conduct in the chair during the past year. He was sure they would all agree that Mr. Broadberry had rendered the Association very excellent service; and they deeply regretted and sympathized with him and his family in the great bereavement they had sustained during his year of office. He would like to congratulate Mr. Broadberry on his appointment as Engineer to the important Company in whose service he believed he was trained. He thought it spoke volumes for Mr. Broadberry's ability, and the confidence the Directors had in him, that he should have been chosen to fill the position. He had great pleasure in

proposing that the best thanks of the Association be tendered to Mr. Broadberry for his services, and to his Company for the very hospitable way in which they had entertained the members on their visit to Tottenham last May.

Mr. A. F. Browne (Vauxhall), in seconding the resolution, remarked that it was not necessary for him to add much to what had been said. Mr. Broadberry was a man who held decided views on gas matters; and he had in the public Press proved his ability to maintain these views against those who differed from him. He thought Mr. Broadberry might retire from the chair with a sense of great satisfaction, and that the members would feel that his name was not the least worthy in the list of Presidents of the Association.

The motion having been unanimously carried,

Mr. Broadberry briefly returned thanks. He said he felt a certain amount of disappointment at not having done all that he had hoped to do during his year of office. He realized that some part of his duty had been left undone; but if in the years to come he should be able to make up for this in any way, he would always be at the service of the members of the Association. He thanked the President and Mr. Browne for the very kind sentiments they had expressed, and the members generally for the way in which they had re-echoed these sentiments.

New Members.

The Hon. Secretary read the following nominations for membership: Mr. G. P. Lewis, of Lower Sydenham; Mr. Frederick Hoult, of Horley; and Mr. W. B. Reidie, of Barking.

Mr. J. Tysoe (East Greenwich) proposed, and Mr. D. H. Helps (Redhill) seconded, the motion, which was agreed to.

The President then delivered the following

Inaugural Address.

Gentlemen,—Permit me to offer you my sincere thanks for the confidence you have shown and the great honour you have conferred in electing me to the position of President. I am very conscious of the many able and experienced gentlemen who have preceded me in this chair; some of them occupying, and deservedly occupying, the very highest positions in the gas profession. With your kind indulgence and assistance, it will be my earnest endeavour to uphold the dignity of the chair, and promote, in every way I am able, the usefulness and interest of our Association.

The past history of the Southern Association has been one of marked success. The contributions have attained a high degree of merit and usefulness; and good feeling, confidence, and sympathy have characterized all the meetings it has been my privilege to attend. But no society can live long upon its past history, however brilliant or successful; and if the Association is to maintain its reputation, it can only be by each member contributing to, and taking a practical interest in, its work and meetings.

The work and duties of engineers and managers of gas-works are yearly becoming more onerous and trying. The progress of the gas industry in the face of keen competition, entails on the responsible officials of gas undertakings a growing load of responsibility and incessant and close personal attention. I can well understand, and sympathize with, members residing at a considerable distance finding it at times difficult, or even impossible, to attend our meetings, however desirous they may be of being present or taking part in the work of the Association. No member can take part in our meetings, and thus be brought into intimate public or private contact—taking part in its discussions or privately comparing notes, explaining difficulties or successes, and visiting progressive works, &c.—without being amply rewarded and better fitted to perform his duties to his employers. The most successful men in the gas profession to-day have been those who have taken an active part, generously contributing of their experience, and doubtless profiting from the experience and results contributed by other members of their respective Associations. It would be difficult to find a gas undertaking in the van of progress, where its responsible managers have followed a course of isolation and seclusion. Where is the engineer who has not found assistance, and the undertaking that has not profited by the experience, experiments, and results that are recorded in the "Transactions" of the various Gas Associations?

The past season has been one of unexampled activity. Never before have there been such demands upon the resources of gas undertakings; and never before has there been, in my experience, such difficulty in obtaining the necessary supply of raw material. With the continuing reduction in the price, and the ever increasing use of gas for motive, cooking, and heating purposes, it follows as a matter of course that, with any scarcity in the coal supply, there will be increased demands for gas; and when dear coal acts in conjunction with cold weather, such as was experienced last December, undertakings not provided with some stock, and a fair margin of manufacturing power, cannot expect to meet their obligations.

It became evident early last season that there was an active and unusual demand for coal; and scarcely any works received their proper monthly quantities as contracted for. Even the most influential and responsible concerns had to draw upon their reserve stores to an alarming extent; many being reduced to two or three days' supply. Unfortunately, oil users were, in many cases, in no better position. It is, however, satisfactory to know that most undertakings were able to fulfil their obligations to the public, and some to maintain full pressures right through this season of exceptional demand.

It is at such times as these through which we are now passing, that the advantage is experienced of doing business with coal proprietors and merchants who honourably consider their obligations before their profits. With such a demand for coal as now exists, it is naturally trying and disappointing to coalowners to have to fulfil their contracts at a price perhaps 100 per cent. less than they could obtain in the market. Contracts, of course, have their advantages and disadvantages to each contracting party. Coal contracts should be carefully drawn and executed in each case. But no contract, however carefully drawn, can meet every contingency that may arise; and it is impossible to be constantly carrying on business in these matters at the point of the legal bayonet. I am not sure how far it is reasonable for gas people to draw up specifications which, after setting forth in detail the quantities of coal to be delivered month by month, then proceed, as is usually the case, to state that the coal contractor must be prepared to make such increases, reductions, easements, or suspension of deliveries as the gas undertaking may from time to time deem necessary, and the gas authority shall have the right to require the coal contractor to make up any arrears which may be so caused.

It is, of course, very necessary to keep a fair stock of coal at the works; and what is a reasonable stock depends upon the geographical position and the particular circumstances of each case. Works depending on seaborne coal have greater risk than works depending on land carriage; and works depending upon one railway for carriage, or upon one coal district for supplies, have greater risks than those having connections with two railway companies, or those which derive their coal supplies from more than one coal-field. I am no advocate of great stocks which are often maintained for the convenience and profit of other people. Under present-day circumstances, with a growing consumption and a prospect of still further expansion in the future, coal purchases should err on the large side; and as far as is possible, nothing should be allowed to interfere with the regular delivery of the monthly quantity as specified in the contract.

With regard to the present extraordinary demand for coal, it would be difficult to assign the true cause. It is probably due to a large number of causes, which, united, and acting together, produce these excessive recurring demands which seem to baffle all known commercial law. It is evident from colliery returns that the scarcity is not due to a diminished output; though it has been suggested that, by the scarcity of labour on the one hand, and the indifference of the labourer who was at work on the other, the output of coal in the country has been restricted. How far this restricted output is the arrangement of the colliers or the colliery proprietors and merchants, it would perhaps be difficult to say. The railway companies have been to blame to a considerable extent by their inability to deal with the mineral traffic in certain districts. It has also been suggested that making good the depletion of stocks, both at home and at foreign coaling-stations, caused by the great strike in South Wales, together with the activity in the iron and steel trades, have produced an abnormal demand for coal. On the Continent, there is something approaching a coal famine. The details of the Board of Trade returns for last month, which are here appended, do not show any considerable increase in the coal exported; yet the amount is, nevertheless, about 20 per cent. of the total output of the kingdom. But you will note the greatly increased value of the coal exported in 1900 compared with the corresponding period of the last two years, which amounts to just 60 per cent. over the value of 1898. There is, however, a very large increase in the tonnage of iron and steel exported, as compared with 1898 and 1899. When it is remembered that every ton of iron is equivalent to two or three tons of coal, the significance of these figures will be seen.

The development of American coal-fields is remarkable. The production of the United States is now nearly five times as much as in 1870; and its proportion to the world's production has risen from 17 to 23 per cent. No other country can show such rapid increase. America is now the largest coal producer of the world. Prices have, of course, risen in America, but (on the authority of the "Economist") not nearly so much as that indicated by the prices now ruling in this country; and the fact that first-class American steam coal can at present be shipped and delivered at Genoa and other places in Europe at 7s. or 8s. per ton less than Cardiff coal, or 3s. to 4s. less than Newcastle coal, cannot fail to bring about a reduction of our exports, and a corresponding reduction in the current prices.

The rise in the price of coal, should it be maintained, will be a serious matter for the country. Can it be that we are beginning to feel the approach of the time foretold by Professor Jevons, over a quarter-of-a-century ago, who then suggested, in his great work on the "Coal Question," that if our consumption of coal continued to multiply for 110 years at the same rate as hitherto, the total amount consumed in the interval would be one hundred thousand million tons? Happily, these figures have not been attained. Otherwise all the available coal in the country would have disappeared, as this quantity exceeds the estimated coal in the country that was available, if working at a depth of 5000 feet was practicable. But it was not suggested that any approach to exhaustion would be reached in any such period as

BOARD OF TRADE RETURNS.

Coal, Coke, Iron, and Steel Exports in January.

COAL.

Place.	Quantities.			Values.		
	1898.	1899.	1900.	1898.	1899.	1900.
	Tons.	Tons.	Tons.	£	£	£
Russia	33,311	35,319	47,071	13,987	16,995	35,650
Sweden and Norway	222,106	267,635	293,929	97,284	131,662	183,319
Denmark	157,482	163,288	144,394	65,999	76,542	88,741
Germany	270,114	278,888	287 050	111,959	126,951	163,761
Holland	68,532	82,100	85,017	30,410	36,504	43,367
France	545,905	515,833	663,761	227,792	236,256	471,828
Portugal, Azores, and Madeira	71,735	44,770	65,089	31,514	22,479	55,311
Spain and Canaries	226,751	210,392	230,913	108,675	112,305	200,922
Italy	394,776	477,544	390,016	163,934	237,707	289,268
Turkey	64,577	47,400	34,981	29,934	25,285	27,599
Egypt	169,408	198,347	147,275	83,456	102,495	120,671
Brazil	99,127	105,312	55.941	54,512	65,376	45,858
Gibraltar	35,411	22,534	22,476	17,266	11,680	20,862
Malta	42,319	51,731	31,837	21,024	28,919	31,816
British East Indies	83,780	81,041	57,677	42,274	44,507	47,722
Other countries	424,475	453,459	525,105	220,747	251.532	411,637
Total	2,909,809	3,032,343	3,087,532	1,320,767	1,527,195	2,238,332

IRON AND STEEL.

	1898.	1899.	1900.
	Tons.	Tons.	Tons.
Iron: Pig	62,910	49,871	130,246
Bar, angle, bolt, and rod	14,806	11,591	13,383
Railroad of all sorts	79,283	44,975	49,781
Wire of iron or steel and manufactures thereof (except telegraph wire)	3,698	3,228	3,531
Galvanized sheets	18,969	16,162	21,796
Cast and wrought iron and all other manufactures (except ordnance)	29,976	26,268	28,922
Old for remanufacture	7,288	6,677	14,576
Steel unwrought	23,583	20,836	29,859
Black plates for tinning (iron and steel)	4,600	4,635	4,540
Manufactures of steel or of steel and iron combined	2,276	4,001	3,538
Total of iron and steel	284,189	207,965	331,183

that named. It was contended that, as the workings of the collieries attained an average depth of less than one-half of the depth estimated—viz., 2000 feet—the cost of working would be such that manufacturers in this country would have to pay a double price for coal.

Jevons, in concluding his remarkable work, says: "The alternatives before us are simple. Our Empire and race already comprise one-fifth of the world's population; and by our plantation of new states, by our guardianship of the seas, by our penetrating commerce, by the example of our just laws and firm constitution, and, above all, by the dissemination of our new arts, we stimulate the progress of mankind to a degree not to be measured. If we lavishly and boldly push forward in the creation and distribution of our riches, it is hard to over-estimate the pitch of beneficent influence to which we may attain in the present. But the maintenance of such a position is physically impossible. We have to make the momentous choice between brief greatness and longer continued mediocrity." While giving all due appreciation to these eloquent and carefully reasoned remarks of Jevons on this subject, I am afraid you will, like Colonel Makins, require further evidence to convince you that the present prices of coal are to be taken as the true price, and real value of the mineral in the open market.

The question of safely storing coal in ships for transport and at railway depots, iron, gas, and other works, is one of no mean importance in these days of strikes and lock-outs. Threatened on the one hand with combinations of labour, and on the other with combinations of capital, it is a matter of serious importance to all who have the responsibility for the conduct of large public or private undertakings to maintain a reserve or stock of coal that shall secure them against any emergency at the colliery, in transit, or at their own works. To safely store coal in large quantities, especially if coals from various collieries are to be mixed together, is not by any means so simple a matter as may at first sight appear.

At the Stapleton works of the Bristol Gas Company all coal is stored in the open. The stores are 450 feet long and 72 feet wide, paved with blue brindle bricks and thoroughly drained. Coal is delivered into the stores by two sets of overhead rails, carried on steel girders, which are supported by iron columns. The coal is dropped from hopper-bottomed railway trucks to the ground, and is stored to a depth of about 20 feet. During the past few years, and more especially last year, we have been troubled with recurring cases of spontaneous combustion. Great care has always been taken with our coal stocks, especially with those coals that were known to have any tendency to heating. A number of 1-inch pipes, to each of which a letter or number is attached, were usually inserted throughout the stock of coal, into which a thermometer could be lowered, and the temperature observed and daily recorded; and when any part of the stock gave indications of heating, that portion was worked out as soon as possible. It has rarely been found, even with the most active coals, that the rise of temperature would exceed from 3° to 5° C. in 24 hours—that is, in the first stage of heating. But after a certain degree is attained, the action is much more rapid; and where air is available, it is destructive.

Various theories have been put forward to account for the spontaneous combustion of coal; and they may be summed up under two heads—viz., (1) the decomposition of iron pyrites, and (2) the oxidization of the coal. In the case of coal mines, there is a third theory—that of friction. An authority has stated: "In mines there are certain mechanical conditions which cause heat, which in a coal containing favourable conditions may be the initial cause of giving rise to a fire. In such cases, it has been suspected that the friction of the moving parts gives rise to a temperature sufficient to start the heating of the mineral. Air slowly circulates through the interstices formed by the roof and pillars which offer a large area of coal surface to its action, and the oxygen of the atmosphere, or the heating may commence in the cracks of the coal seam itself, and then extend to the goaf." However this friction may operate in coal mines, with regard to the cases under consideration, friction, as a cause of heating, may be dismissed.

In considering the decomposition of iron pyrites as a cause of heating, it will be noted that the two coals which experience has proved to have a tendency to heating, and which are marked on the table of analyses as "C" and "E," do not contain a large quantity of volatile sulphur—indeed, all the coals in the Bristol district are comparatively free from sulphur. It is very generally admitted that in the presence of moisture, pyrites undergoes oxidization and disintegration, furnishing additional fresh-cut surfaces of coal to absorb oxygen, the chemical action develops heat and the further oxodization of the coal. Great differences of opinion have existed, and do still exist, as regards the influence of iron pyrites and its affinities when found in coal. Spontaneous combustion has long been known in connection with other organic substances besides coal. Coal, as you know, varies considerably in chemical composition and also in physical structure. The ultimate analysis of coal does not show very great differences, yet the physical features vary very much. Given a number of fine coal particles containing rich hydrocarbons in the presence of moisture and atmospheric oxygen, and you have all the elements required.

Analyses of Coals Stored at the Stapleton Gas-Works.

Class.	Volatile Matter.	Fixed Matter.	Moisture at (100° C.)	Ash in Fixed Matter.	Total Sulphur in Coal.	Volatile Sulphur. ($S=FeS_2$)	Fixed Sulphur, in Ash. ($S=CaS_4$)
FROM MIDLAND COAL-FIELDS—							
Screened "A"	39·85	60·15	4·83	7·54	1·75	1·56	0·19
Nuts "B"	44·50	55·50	6·63	6·58	1·30	1·23	0·07
" "C"	38·75	61·25	4·58	4·04	1·27	0·62	0·65
FROM LOCAL COAL-FIELDS—							
Through "D"	32·45	67·55	1·78	9·45	1·22	0·32	0·90
Small "E"	33·80	66·20	2·83	17 89	1·04	0·77	0·27
" "F"	34·00	66·00	2·28	13·75	1·02	0·79	0·23
Through "G"	30·85	69·15	1·63	9·26	0·97	0·94	0·03
Small "H"	31·80	68·20	2·03	14·15	0·80	0·05	0·75
" "I"	34·90	65·10	2·13	15·54	0·70	0·60	0·10
Screened "J"	37·30	62·70	2·63	10·30	0·62	0·55	0·07

Professor Lewes some years ago pointed out that newly-won coal will take in, or absorb, one-and-a-half times its own volume of oxygen, and in some coals as much as three times its volume. A recent article contributed to the German Chemical Society by Professor Fischer says: "Thorough investigation has established the fact that various coals behaved very differently regarding spontaneous combustion; a great deal depends upon the size of the pieces, as well as upon the dampness. A loss during storage, or self-ignition of coal, is nothing more than manifestations of oxidization." If this represents the total knowledge of German chemists upon this subject, I can only add that the general facts given have long been known to every observer who has taken any interest in the subject.

Heating always takes place in the small coal; but I have come

across cases where large coal, and also nuts, lying against small, or covered by small, have developed spontaneous combustion. It would seem in some cases that the interstices or air-spaces formed between the large and nut coal provided the necessary atmospheric oxygen, which, acting upon the hydrocarbon particles of the small coal, chemical action was set up; and the heat produced develops a certain peculiar chemical change in the coal. One of the first indications of heating is the steam, or vapour, which usually escapes from the stack by the course of least resistance, which may be far removed from the seat of the cause. As the heat develops, certain gases are evolved, of the acetylene series, which give a distinctive and peculiar odour, exactly the same as that found in coal-mines. The odour is characteristic, and exclusive to the gases evolved from spontaneous combustion. No one could mistake this odour, which can be detected even at a considerable distance.

I have been led to suspect that there is some kind of chemical action induced when coals from different collieries are mixed together, differing to some extent from simple oxidization. I have known cases where spontaneous combustion has taken place in coal that had not been six weeks in stock. In a number of instances, the chemical action has just produced enough heat to congeal the whole of the surrounding coal into one compact mass. So long as these affected portions of the stock were kept free from atmospheric oxygen, which was done by battering it well down with small coal; and, under these circumstances, very little further harm was done. In all these cases, the coal was used up as soon as possible.

An instance was recently brought under my notice of a coal that was only subject to spontaneous combustion when stacked in one particular part of the colliery grounds. Upon investigation, it was found that a drain passed underneath this particular part. Into the drain, the exhaust steam from the engine was passed; and thus heat was conveyed through the ground to the coal above, raising it to the necessary degree of temperature to induce chemical action which, in other circumstances, would have remained dormant. In another case, a large stack of dry coal was fired by spontaneous combustion induced by moisture, caused by the slight leakage from a steam-pipe passing over the stack. Yet in a colliery in the Bristol district, the workings of which are said by the Engineer to be as dry as snuff, there have been repeated cases of spontaneous combustion that could not possibly be due to the presence of moisture. Probably the combustion in this case was due to oxidization pure and simple. It is thus evident that no one theory can be applied to all cases. Friction cannot apply to the hold of a ship or coal stored on land. Oxidization is certainly one cause, if not the chief cause, of spontaneous combustion.

Mr. Stokes, one of H.M. Inspectors of Mines, in a recent communication to the Board of Trade on the subject of spontaneous combustion, says: "Fires appear under the most peculiar and erratic conditions; one part of the mine being subject to their generation, whereas another part of the same mine is never troubled. Under whatever conditions they occur, the premonitory symptoms, as a rule, are the same—a rise in temperature, a sweating of the roof near the place, and the peculiar characteristic smell, the result of decomposition of the mineral." Our observations at Stapleton fully confirm this regular order of procedure in the course of spontaneous combustion. The rise of temperature followed by the "sweating of the roof" is, however, evidence of the presence of moisture in the coal in those cases referred to by Mr. Stokes; and I have also observed instances where there has been a considerable rise of temperature and visible evidence of vapour, and yet little or no decomposition of the mineral, which would doubtless have ultimately followed had the coal remained. A German writer has recently stated that sufficient light has not been thrown on this question. There still remain a great many important points to be cleared up; and he expresses his regret that the chemistry of coal has been dealt with to so slight an extent, even in Germany.

I had observed some years ago that coals stacked not more than 6 or 7 feet deep never showed any tendency to heating. In this case, it is evident that the heat of oxidization is carried off into the atmosphere, without raising the coal to the temperature necessary to induce active or destructive chemical change, and little or no damage is done to the coal. Attempts have also been made to ventilate by running air-shafts through the coal-stack; but the latter state of that coal has been worse than the first, because the air, instead of keeping the coal cool, supplied the necessary oxygen, and greatly facilitated the destruction of the coal. Several suggestions or recommendations have been made to prevent the heating of, or to cool the already heated, coal in ships. The application of steam-pipes, I understand, is compulsory in vessels carrying coal under the American flag; and Professor Lewes some time ago suggested the distribution of cylinders of compressed carbonic acid gas, secured with fusible plugs, throughout the coal cargo.

Water and steam have always, in my experience, contributed to the spread of combustion; but I have had no practical knowledge of their application to coal in a ship's hold. To maintain large stocks of coal, and periodically or regularly work them through, to prevent heating, &c., is inconvenient, and entails considerable cost. Under such circumstances, it is impossible to receive the daily deliveries of coal at the most convenient place for working—viz., the breakers or elevators—or even at the most convenient place for handwork.

To provide a reserve of coal that should only be used in cases of real emergency, I would suggest that, where practical, a quantity of special coal should be bought—large, entirely free from small, and of a hard and close texture—and carefully stacked apart. Such a coal would stand for years without any very serious loss. There would, of course, be the interest on the outlay and cost of stacking. With such a reserve, the ordinary stores could be used for receiving, and conveniently dealing with, the ordinary monthly deliveries, with the least possible handling of material. Coal should, of course, in all cases be received as dry as possible, and care taken so that no damp coal is covered up with dry. The receiving stores should in all cases, where possible, be covered in, both in the interests of the workmen and the material.

It is painfully evident in many places throughout the country that the attitude of labour in the larger gas-works is anything but satisfactory. The workmen are being taught by the modern Socialistic agitator that they are the sole producers of all the wealth of the country, and that they are robbed of their labour by the grasping capitalists. How few of our workmen or gas consumers really know that the shareholders of nearly all the leading gas companies of the kingdom are not, and have not for years been, receiving more than about 4 per cent. upon their investments.

No class of labour in this country is better paid, or has generally received more kindly treatment, than that of gas workers. In most cases, eight-hour shifts and an annual free week's holiday have been granted. Every case of accident, in many works, has been granted compensation, even years before the Workmen's Compensation Act came into force; and the old-age pension problem has, in many instances, been solved by granting to workmen incapable of further service a pension of from one-third to one-half of their weekly wages, computed upon their years of service, to which grant in some cases the men are not even required to contribute a penny.

Unfortunately it is not in the interests, or in the nature of this class of Unionism, to be peaceful; and not only are the relationships existing between employer and employed thus often strained, but where such Unionism dominates, the general quality and quantity of work deteriorate. Individual freedom is banished, as far as the Union is concerned; and men are compelled, by subtle and relentless petty persecution, to join the Union or to leave the work. There is also reason to believe that it is one of the deliberate aims and objects of modern Unionism to establish a rule or system that men shall come on and go off at the beginning and end of the season in strict accordance with a blind rule that the last to come shall be the first to go. This is what is termed securing every man his "place and turn."

Foremen or managers are thus able to exercise, under these circumstances, little or no discrimination in taking on or sending off men. Skill, careful attention, and industry go unrewarded; and the inevitable consequences follow. In all such works, the standard of workmanship must be, and is, reduced to that of a declining average mean. I am informed that there are works where this rule is carried to such an extent that, once given employment, the workman practically secures a vested right of place and position in the works, so long as he can anyhow perform the duties; and the Union will claim to be judges equal with, if not superior to, those of the employers' representatives as to their fellow workmen's fitness or capacity. What could be more disheartening than to witness—as could be witnessed, in some large gas-works under such conditions—the scandalous waste, the utter disregard for the time and property of the employer, and the repeated violation of the most elementary principles and rules necessary to the successful operations of modern gas-works?

Compare this with the careful German, Belgian, or French workmen, to whom no detail seems to be too small to be overlooked. Recently the Bristol Gas Company received from a firm in London who possess manufacturing works in Scotland a quantity of steel work. After the material had been partly fixed, it was quite accidentally discovered that it had been manufactured in, and was imported from, Belgium; and I am compelled to admit that better material, or more perfect workmanship, could not have been produced. This is, unfortunately, by no means a solitary instance of the kind. How is it that we are thus beaten in our own markets, possessed as we are in such an exceptionable degree with rich mineral deposits of iron and fuel, and the immense advantages such possessions should give us in competition? How much is due to our excessive royalties, or how much of it is due to our out-of-date manufacturing plant, it would perhaps be difficult to say. But there can be no doubt much is due to the short-sighted, and ultimately destructive policy, that binds our artisans to one common level of execution and reward—the intelligent, industrious, and capable workman binding himself to, and making himself responsible for, the idle and incapable; both relying on their trade organization to keep them in employment, and to maintain their wages, irrespective of the workmanship, the cost of production, or the demand existing for that production in the open market. Workmen have an undoubted right to combine for the legitimate purpose of protection, or for the sale of their labour; but it must be admitted, however much we may sympathize with the legitimate objects of Unionism in theory, the practical results of such combinations as those named are in most cases detrimental to the best interest of both workman and employer.

It is important, and necessary, that all employers should treat

their workpeople with justice and consideration, and, in a prosperous industry like that of gas, even with generosity. That this has been done in all cases, is doubtful. Injustice and arbitrary treatment afford the opportunity of the agitator, and do more for the cause of Unionism than all the stump oratory of the demagogue. Much of the labour in a gas-works is of a very trying and arduous nature; and the intermittent nature of a considerable portion of that employment renders it necessary that it should be paid fully up to, if not a little over, the standard rate of wages in the district. High wages need not mean increased cost of production. Good pay is economical in well-managed works.

There can be no success in any undertaking without a close and real sympathy with the workmen and appreciation for their many individual fine qualities. Those responsible for the control of workmen should see that even-handed justice is done to every man; but, at the same time, it must be remembered that strict discipline and rule are indispensable, and are more calculated to produce harmony and comfort in an establishment than any policy of weakness and vacillation in passing over repeated breaches of rule and discipline.

The British workman, taking him all round, and if left to himself, is loyal, capable, and industrious, and at times heroic, because much of our work can only be done by men of skill and courage; and it is because of respect and admiration for his many good qualities, that it is desired to secure his perfect freedom and liberation from such a system as that described.

It was my intention to have alluded to the subject of water gas, and also to the growing deficiency of the initial pressure of gas obtained from modern gasholders for the purposes of distribution, and the assistance of exhausters and fans for this purpose. These subjects presented so much debatable matter, and knowing that many of you feel the keenest interest, especially in the subject of water-gas, it appeared unfair for me to take advantage of the chair and advance opinions and views where there would be no opportunity of reply. Gentlemen, I am afraid that I have already trespassed too long upon your time, and can only conclude by thanking you for the kind and patient hearing you have given my remarks.

At the conclusion of the address,

Mr. W. B. Randall (Waltham Cross) moved that a vote of thanks be awarded to the President for his extremely interesting address. One of the most important of the matters he had dealt with was the spontaneous combustion of coal—a trouble which perhaps was a little difficult to account for.

Mr. F. G. Cockey (Newport, I. of W.), in seconding the proposition, said the President had introduced some very interesting subjects, which he (the speaker) had no doubt the members would, in the course of the year, give them an opportunity of discussing.

The motion having been carried by acclamation,

The President thanked the members for the vote, and the business proceedings then terminated.

At the conclusion of the meeting, the members dined together, under the chairmanship of Mr. Irving.

The Chemical Industry of Japan.—The present position of the chemical industry in Japan is referred to in the "Board of Trade Journal." Near Osaka, the Yuso Kwaisha alkali works and the Nippon Yuso Kwaisha sulphuric acid plant are both in steady operation. It is stated that the first-named plant was started in 1893 by English engineers, who fitted it up on the most approved principles; but it is now entirely under Japanese management. At the latter works, sulphuric acid is concentrated in porcelain vessels in terraced succession. The acid, packed in earthenware carboys, has been exported in small quantities as far as Bombay.

Germany and the Metric System.—A report on the commercial value of the metric system, with special reference to the classification of German iron manufactures, was recently forwarded to the Wolverhampton Chamber of Commerce by the British Consul at Amsterdam. He states that the iron and steel manufacturers' unions of Germany have adopted a uniform system of dimensions for articles of universal consumption at home and abroad. Angle-iron of all descriptions, flanged boiler ends or fronts for Cornish or Lancashire boilers, the boilers themselves, and iron and steel tubes and all fittings connected with them (such as valves, cocks, and T-pieces), are made, so far as flange, diameter, and working lengths are concerned, in normal standard sizes, in order that every part of one work may be procured at once to fit every corresponding part of another construction. The normal standards are all fixed by the free co-operation of the combined German Engineers' Associations, and are adopted by the various manufacturers all over Germany. At present, a Committee of the Engineers' Associations are occupied in endeavouring to fix a metric thread for bolts and screws, nuts, bolt-heads, &c., as the present universal normal standard (the Whitworth) is so differently constructed by different works that the parts are not so interchangeable as should be the case. The Consul points out that Germany and the Continent generally will have a constantly increasing advantage over British manufactures in future in foreign countries, unless the metric system be fully and entirely adopted by Great Britain.

REGISTER OF PATENTS.

Manufacture of Water Gas.—Boult, A. J.; a communication from E. Fleischer, of Dresden. No. 4495; March 1, 1899.

This invention (the specification of which is not illustrated) relates to the production of water gas in twin generators, by first heating the generators to different temperatures, adding coal to the less highly heated generator, and then passing steam through this generator in the same direction as the blast used for heating it—the gases evolved thereby then passing through the second generator in the opposite direction to that of the air-blast previously driven through it, for the purpose of heating it. It has been found, says the patentee, that not only coke and anthracite, but also bituminous coals, are very well adapted for such an arrangement of two generators; the special difficulties of using such coal being overcome by distilling it, and converting it into coke after it has been charged.

The process is preferably so carried out that the steam is caused to enter from below into one of two generators, and that the products produced in this generator pass over to the second generator and enter into it at the top. The gas formed in the first generator passes into the second, through the upper colder strata to the hottest strata below. Thus the heat is, it is said, advantageously employed, and all the carbonic acid is changed into carbonic oxide. Further, gas is also distilled from a charge of fresh coal by means of the heated gases passing through the charge—such "new gas being also changed into permanent water gas in the second generator as it passes from the top to the bottom through the gradually increasing degrees of heat, by which the formation of tar is avoided."

A "practical arrangement of the whole process, which is independent of any specially constructed generator," is described as follows: Coke is placed in two generators, and one of the generators (A) is heated to a lesser temperature—say, 900° C.; while the other (B) is heated to, say, 1100° C. The colder generator is charged with a stratum of coal; and steam is admitted into it. This steam is decomposed, and the evolved gases, carbonic acid and hydrogen, as well as the particles of non-decomposed steam or of carbonic oxide, pass through the fresh charge, evolving from it new products of distillation. The mixed gases then enter Generator B, and pass through it from top to bottom. In this passage, the carbonic acid is reduced, and the products of distillation decomposed, whereby water gas issues from the bottom of the generator. During this operation, Generator A is cooling down—say, to 700° C.; while Generator B will hardly have cooled below 900° C. The steam and water gas conduits are closed as soon as it is found that the issuing gas does not correspond to the required conditions; the connecting channel between the two generators being also closed. Generator A is then again heated by a blast to a temperature of, say, 1100° C.; and the same conditions are re-established as at the beginning, only that Generator A has changed places with Generator B as regards temperature. After having charged the second generator with coal, steam is caused to pass through it, and the production of water gas is carried on as before.

As will be understood, the patentee points out, it is possible to charge the first generator with coal sooner than has been indicated above—that is to say, before or at the same time that it is heated by means of the blast. This arrangement can also be advantageously combined with the Dellwik gas process, described in patent No. 29,863 of 1896. According to this invention, such a quantity of air (calculated according to the height of the layer of burning material) is made to pass from below into the generator, that the products of combustion may result in as much carbonic acid gas as possible—at any rate, more carbonic acid than carbonic oxide.

Prepayment Meters.—Green, H., of Preston. No. 4738; March 3, 1899.

This invention has particular reference to prepayment fluid-meters of the kind described in a patent granted to the same inventor in 1896—No. 19,067; one object being to provide price-changing mechanism whereby the quantity of gas permitted to flow through the meter in exchange for a given coin "can be readily and definitely varied, in accordance with the current price, without substituting for one or more existing parts of the meter others of a similar kind but differing therefrom in their relative proportions, or otherwise." Other objects are to provide means for preventing a second coin being inserted in the coin-shoot until the coin previously inserted has performed its function—thus preventing the jamming of the coins in the shoot; and for preventing coins beyond a certain number being inserted and used, thus permitting the operation of the prepayment mechanism before gas is delivered.

Figs. 1 to 4 (see p. 614) illustrate the price-changing mechanism according to this invention applied to a dry gas-meter having prepayment apparatus of the kind described in the earlier patent. Fig. 1 is a plan, partly in section, of so much of the meter as is necessary to illustrate the improvements (the casing being removed); fig. 2, a section on the line X of fig. 1; and figs. 3 and 4, detail views of the gear-wheels.

A worm A, driven by the meter proper, gears with a mutilated worm-wheel B, and is connected with a worm-spindle C that gears with a worm-wheel D fixed to one of the hollow plugs of a compound cock (described in the 1896 patent), and which controls the passage of gas through the meter. The other plug is actuated by hand through any appropriate coin-freed mechanism. The two hollow plugs are so arranged one within the other that, in certain relative positions, they close the gas-passage; and then, if a coin be inserted through the coin-slot E of the meter and a handle F be actuated, the second hollow plug may be actuated to a given extent. Thereupon the gas-passage through the compound cock will be opened; and, as gas flows, the first hollow plug will be actuated by the meter proper so as, by the time the quantity of gas paid for has been delivered, to again close the gas-passage through the compound cock.

The worm A also gears with a second mutilated worm-wheel G (shown separately in fig. 4), and is loosely mounted on a fixed tubular stud H, the axis of which is in line with the spindle C. Frictional contact between the two wheels B and G is prevented by a collar or flange on the stud H. The two mutilated wheels together constitute what is designated a compound toothed wheel. The peripheral portion of the wheel B is shown connected to its boss by arms; and the wheel G is adapted to receive two pins I and J screwed through it so as to project laterally into the opening in the

body of the wheel B. The former pin may be fixed, and the latter one moveable and screwed through any one of a series of holes arranged in a part circle at equal distances apart. The position of the fixed pin in relation to the arms must be such that the gaps of the mutilated wheels can never overlap each other.

When the pins (as shown in fig. 2) abut respectively against the arms

Fig. 1.

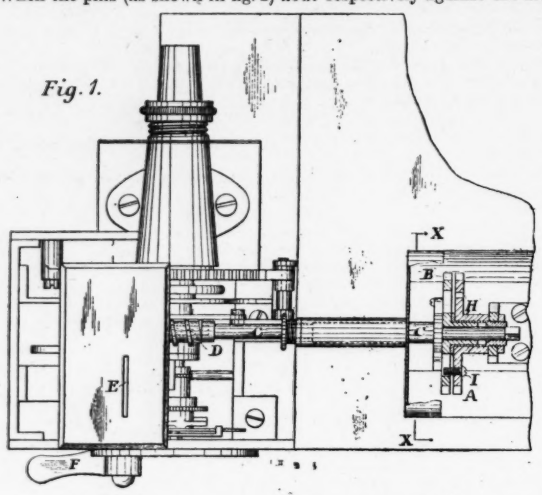


Fig. 2.

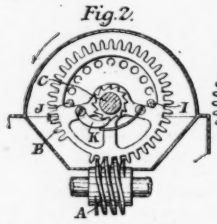


Fig. 3.

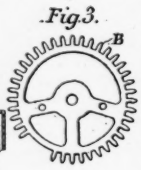
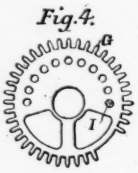


Fig. 4.



of the wheel B, both wheels will be coupled together so as to form a complete wheel having, say, forty teeth. The teeth of each wheel overlapping the gap in the other wheel, and relative or independent movement between them being prevented by the pins, the two wheels will be continuously driven as one wheel so long as the worm is in motion—that is to say, as long as the gas-passage of the compound cock remains open, and consumption of gas occurs. The gearing may, for example, be so proportioned that, when the wheels are thus coupled, 20 cubic feet of gas can pass through the meter between the opening of the gas-passage by means of, say, a penny and the closing of the same by the meter. When, however, the pin J is shifted to the next hole, both wheels will, if the arm abuts against the pin I and the wheel B gears with the worm A, travel together until the gap in the wheel B is over or against the worm A, when the wheel will become disengaged from the worm and will stop rotating. The wheel G, however, being in gear with the worm, will then be moved relatively to, or independently of, the wheel B, until the pin J abuts against the arm, whereupon the wheel G will drive the wheel B forward until it again gears into the worm. Both wheels then again travel together until the gap in the wheel G is over the worm A, whereupon the wheel G becomes disengaged from the worm, and will stop rotating; but the wheel B will continue to rotate, and will thus bring its arm into contact with the pin I, and then drive forward the wheel G until it again gears with the worm. With the pin J in the second hole, such an amount of relative movement is permitted when the gap of the wheel B is over the worm, that the wheel and the inner plug of the compound cock cease to move, while the wheel G is moved idly for a distance equal to two teeth. The wheel thus transmits the motion of the worm in the ratio of 1 to 42 instead of 1 to 40, as is the case when the wheels are coupled, and thus allows 21 cubic feet of gas to pass through the meter between the opening and closing of the gas-passage of the compound cock, instead of 20 cubic feet. If the pin J be removed altogether, then the wheel B and the inner plug of the cock will cease working while the wheel G is moved forward a distance equal to (say) 20 teeth, thus making the wheel B transmit the motion of the worm in the ratio of 1 to 60, and permitting 30 cubic feet of gas to pass for each penny.

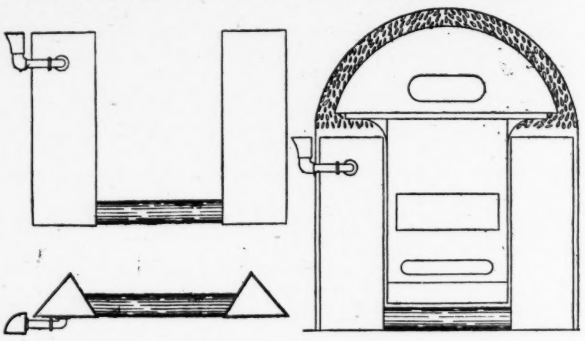
Thus, by removing or varying the position of the pin J, the meter can be adjusted to deliver 20 or any greater number of cubic feet of gas, up to (say) 30 cubic feet, in exchange for each penny inserted; and, as will be understood, the limits of adjustment may vary, and the shifting of the pin from one hole to the next may be arranged to cause a variation of the supply of more or less gas for each penny.

The motion of the worm may be conveyed to the worm-spindle C by a spring pawl K and a ratchet-wheel carried respectively by the wheel B and the worm-spindle C; the object being to enable the latter to be moved forward by hand independently of the action of the meter mechanism, so as to re-set the indicator to zero when the meter is to be used by a new customer.

Gas-Stove with Water-Heater.—Richmond, E. W. T., of Warrington. No. 5192; March 9, 1899.

The patentee proposes to provide within the space enclosed by the perforated or openwork case of a gas fire-place, at each side, a vessel adapted to contain water—the two vessels being connected together by a pipe, so as to be in communication with each other; while at a suitable part a pipe extends from one or both of these vessels, through the casing of the fire-place, and by its means they may be charged with water from outside. The vessels extend up from the lower part of the fire-place to above the level of the grate or combustion space, and are open at the top. The effect is that the water vapour given off does not mix with the gases of combustion, and pass away with them up the chimney flue, but issues with the air heated by the fire-place out through the perforations or spaces in the outer case, and so "humidifies" the warm air discharged from the fire-place into the room.

As shown in the illustrations, there are two vessels placed in the casing of the gas-fire on each side of the fire-place proper. These vessels

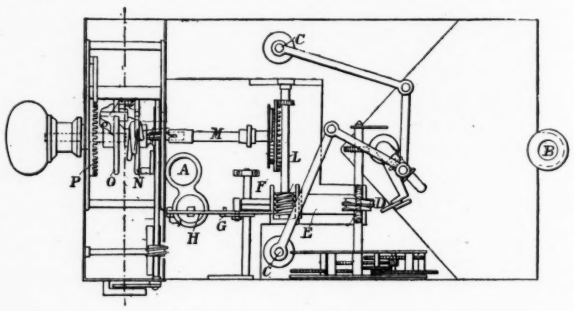


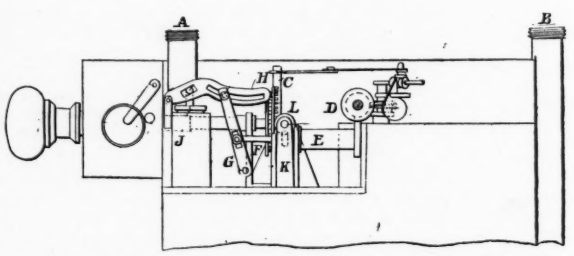
are filled with water, and are open at the top, and connected below by a pipe, so that the water-level in each is equal. They are filled by one filling-device, consisting of a pipe connected with one of the vessels at the back, and with a filling-mouth outside the casing of the fire. In action, the water in these vessels becomes warmed by the heat of the fire, conduction, &c.; and the vapour given off at the free surface in them mixes with the heated air produced in the fire-place, and passes out through the perforated casing above.

Prepayment Gas-Meters.—Pinchbeck, J., of Clerkenwell, E.C. No. 5656; March 15, 1899.

The mechanism of this prepayment meter consists of a nut moved longitudinally on a screw on the spindle of the meter in one direction proportionally to the consumption of gas, and in the other direction proportionally to the number of coins introduced. Towards the end of its travel in the former direction, the nut actuates an arm or lever connected to the gas-supply valve; and its further travel cuts off the gas until it is moved back again by the introduction of more coins.

The illustrations are a plan and side elevation (with the case removed) of an ordinary gas-meter to which apparatus has been added to make it a prepaid meter in accordance with this invention.





A is the gas-inlet pipe, and B the outlet. C are splindles caused to oscillate by the passage of the gas, and which, by means of links, rotate a spindle, which has fixed to it a worm gearing with the worm-wheel fixed to the shaft by which the counting and recording mechanism is actuated. The worm D is fixed on a shaft gearing with a worm-wheel forming part of a sleeve E, which has an internal screw-thread and contains a screw-plug fixed to a square rod F. The end of this rod carries a pin working in a slot of the lever G, which has one end pivoted, and whose other end carries a pin working in a slot in the lever H. J is the rod of a valve on the gas-supply pipe, and carrying a pin working in a second slot in the lever H. As gas is consumed, the rod F is moved from right to left; and when the nut on it approaches the end of the sleeve E, the lever H is pulled down—closing the valve—and the gas is cut off. K is a sleeve through which the rod F passes, but which is prevented from moving longitudinally by the framing. There is a worm-wheel fixed to the sleeve K and gearing with a worm on the shaft L, which carries a pinion gearing with a crown-wheel mounted loose on the shaft M—being driven in one direction by a pawl gearing with the ratchet-wheel fixed on the shaft. This shaft is turned on the introduction of a coin, thereby rotating the rod F and nut; screwing the latter into the sleeve E, and thus moving them from left to right. On the shaft M is fixed a disc N having a slot in it. O is a second slotted disc

worked by a handle. P is a crown ratchet-wheel; and there is a pawl operated by a spring engaging with it. Q is the coin-slot.

On a coin being introduced into the slot Q (the parts being in the position shown in the plan), it falls into the slot between the jaws on the disc O, and also engages with the slot in the disc N, and with the teeth of the ratchet-wheel P. On the handle being turned, the discs and ratchet-wheel all rotate together—being connected by the coin; and the shaft M is therefore rotated, moving the nut on F from left to right. So long as the coin remains in place, the handle cannot be turned back again—being prevented by the pawl which engages with the ratchet-wheel P. But when the coin drops out, the handle is disconnected from the ratchet-wheel, and can be turned back freely, carrying with it the disc O and also the disc N—a lug on the one engaging with a lug on the other. The shaft M shares the backward motion, but not the wheel, which is retained by its pawl. The angle through which the handle and other parts can be rotated for each coin is limited and properly regulated.

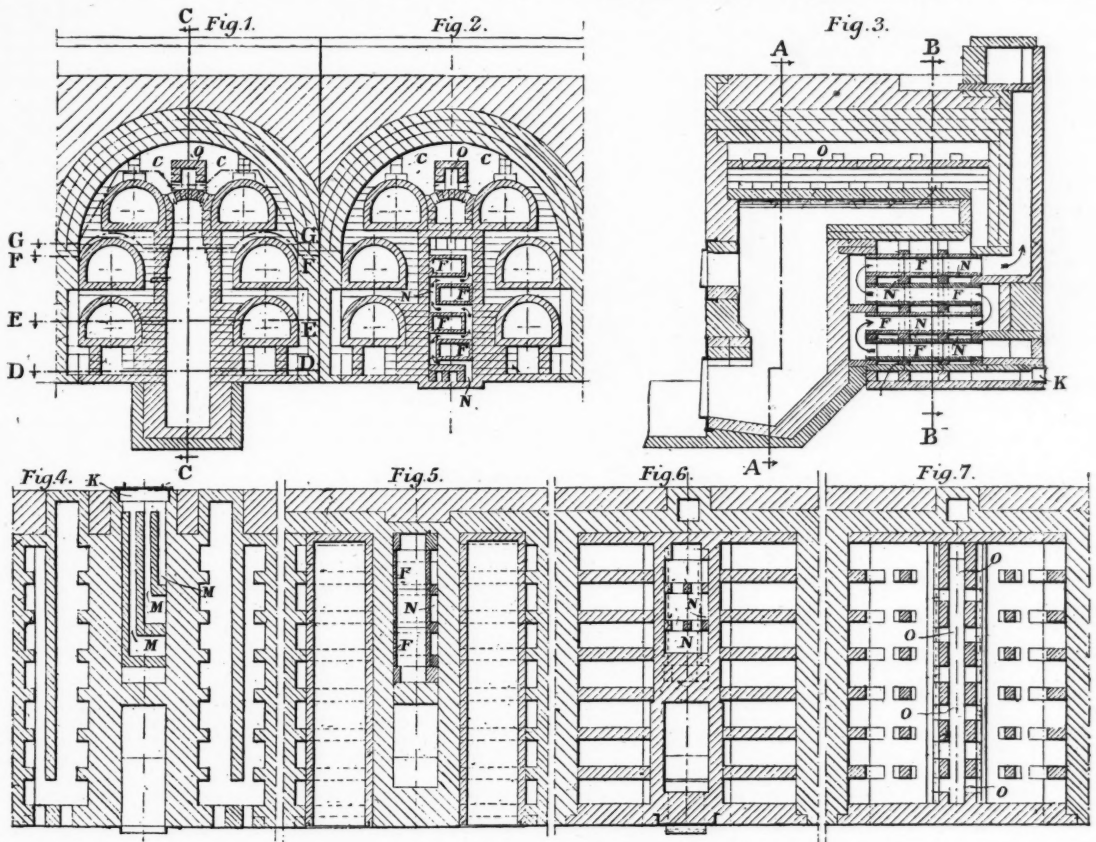
Regenerative Furnaces.—Drake, J. A., of Halifax. No. 5710. March 16, 1899.

According to this invention, the producer is placed between the retorts to be heated (so as to avoid the necessity of sinking a deep substructure), and wholly inside the front line of the structure. The sides of the division-walls are recessed, so as to allow for the passage of furnace gases from the combustion chamber on the top of the producer arch in a ziz-zag manner in, round, and about the retorts, while the gases are on their way to the main or exit-place, which is preferably arranged either on the top or at the bottom of the setting, as may be most convenient. In the space formed between the inner back wall of the producer and the external wall of the structure, provision is made for the introduction of a supply of secondary air to pass through or around a series of tubes arranged longitudinally from front to back or crosswise, so that the air is "very highly heated."

Fig. 1 is a sectional front elevation of the furnace taken on the line A of fig. 3. Fig. 2 is a sectional front elevation on the line B. Fig. 3 is a longitudinal section on the line C of fig. 1. Figs. 4, 5, 6, and 7 are sectional plan views taken respectively on the lines D, E, F, and G of fig. 1.

The details of construction are shown so fully that no description of the arrangement is needful.

The secondary air is shown as being drawn in at the rear of the structure—passing, firstly, into a chamber or box K, admission to which is controlled by sliding doors or valves, and thence along channels or conduits M, each of which opens at its inner end into a separate and independent air-passage N, up which the secondary air passes in a zig-zag manner around the recuperative tubes F in the direction of the arrows, until, in a highly heated condition, it finally reaches the chamber O built in the crown of the producer arch, whence it passes through lateral openings or passages into the combustion chamber C, where it



meets the furnace gases emerging from the producer through openings, and combustion ensues. The separate air-passages are formed by the supporting walls, which are made solid from side to side of the recuperative chamber. Wedge-shaped blocks may be employed to control the area of the channels, or each of them may be continued to the back of the structure, and provided with a separate sliding door or valve to control its area, and consequently the admission of secondary air to its corresponding air-passage. "By this means, a regulated supply of secondary air is obtained from front to back of the recuperator tubes, whereby local heating of the parts is prevented."

Coin-Freed Gas-Meters.—Pearce, G. W., and Whitbread, S. J., of Bishopsgate Street, E.C. No. 5756; March 16, 1899.

This invention relates to the construction and arrangement of several appliances affixable to any gas-meter, "in or by which a weighted push-back rod can be operated by coins forced from a receiving slot to open a gas-valve due to the slip of a finger from a pin to the tail of a hook, and from thence to the next pin of a series projecting from a disc during the return motion of such rod."

Fig. 1 (p. 616) is a plan of coin mechanism operating parts within the upper casing of the meter; the appliances being in the position of rest, and the gas-inlet valve fully open. A block-bar is then across the path of the coin-receiver, to prevent the fresh entry of coin until some portion of the gas already paid for has been consumed. Fig. 2 is a side elevation of the coin-operative mechanism in the same positions; the gas-valve being open. Fig. 3 is a side elevation of the coin-operative mechanism, with the gas-inlet valve returned to a closing position, and showing the varied positions each inserted coin has to follow after being passed into the coin-receiving slot, until it finally falls into the cash-box. Fig. 4 is a face view of the disc with the head of the gas-valve in position when open. Fig. 5 is a corresponding view, showing the position of the head of the gas-valve when lifted and the valve closed.

Bearings B support a back-throw or end-on motioned rod C, carrying on its back end a weight D. Between the bearings, the rod C has a projecting lip-plate E, and the front end a collar, against which a coin-discharger pressed forward by a spring has a bearing. The front of the rod C terminates in a rounded head, which each coin has to bear against, so as to force the rod C back to the position shown by the dotted lines in fig. 3. The rod also carries a cranked guard I, which, when the full number of coins has been inserted for opening to its fullest extent the gas-valve J, comes across the bottom of the coin-slot, and prevents their passage, should any additional coins be inserted, until some consumption of gas has taken place, when the guard will be removed automatically and the passage freed.

The rod has affixed to it a pointer or finger normally in contact with the inner face of an otherwise loose disc L. This disc remains stationary during the push-in action of the rod C by the coins, in which case the finger which bears against one of the pins projecting from the back face of the disc, is pushed rearwardly when the rod is forced back; and as the finger is pushed from the end of the pin, it falls on the tail of a hook-like projection N. During the return motion of the rod under the action of the spring, the finger drops from the tail-end of this hook, and lodges on the next lower pin; the two motions corresponding to the quantity of gas to be given in exchange for the inserted coin.

The disc L, although free of the rod C, is supported by a collar and separate bearing; and any back-action is prevented by a ratchet-wheel and stop-pawl.

The foregoing explains the opening of the gas-valve proportionate to the number of coins inserted through the slot S, and successively passed by a moon-shaped plate or a star-wheel, which receives the coins singly, and forces them when the handle is operated—each coin, as it finishes the pressing back of the rod C by falling on a lug of the tilting cradle G, becomes shot therefrom by the return motion of the rod due to the tension put upon the spring, and from thence falls into the cash-box.

Now, supposing consumption of gas commences, the meter mechanism

of the usual construction and arrangement operates the index-shaft W, by and from which the quantity consumed becomes registered; and by the addition of an extra gear-wheel, or of a series of gear-wheels at X, a cranked-shaft Y is rotated, to the crank of which is attached a draw-

Fig. 1.

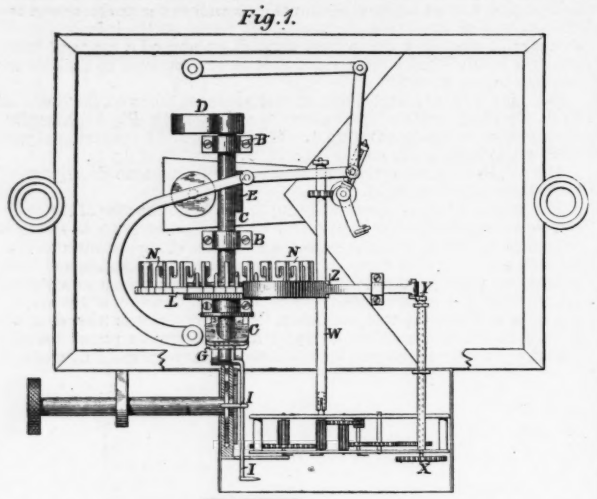


Fig. 2.

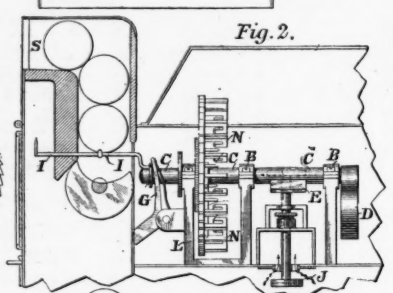
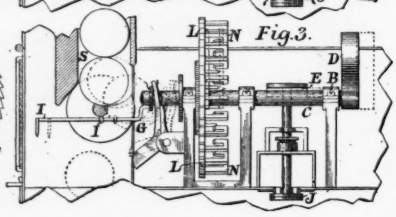


Fig. 4

Fig. 5.

Fig. 3.

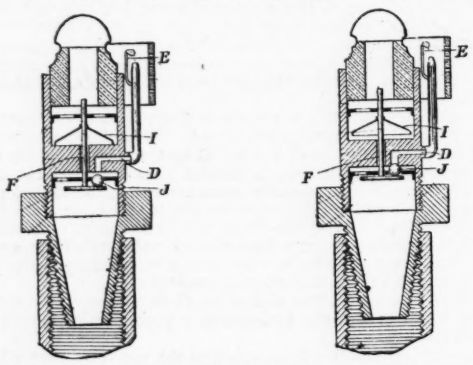


pawl Z, to engage teeth on the edge of the disc L, or it may be pins projecting from the front face of the disc, which, in its turn, draws the finger resting against one of the pins with it, and this by turning the rod C lifts the weight D a proportionate distance, and so on until the lip E lifts the head, and closes the gas-valve J to shut off the supply.

Self-Lighting Gas-Burners.—Kent, H. A., of Bowes Park, N. No. 6051; March 20, 1899.

This invention relates to the combination of a gas-tube, a passage for gas from the tube to the burner, a pilot-jet, a passage for gas from the gas-tube to the pilot-jet, a hollow conical valve normally closing the gas-passage to the burner, a rod or spindle connected to the conical valve, a disc or arm on the rod or spindle, and a valve carried by the disc or arm to close the gas-passage to the pilot-jet when the conical valve is moved by the pressure of the gas to admit gas to the burner.

The illustration shows the position of the parts, when the gas is unlighted and lighted respectively. In the gas-way between the tap and burner is a disc or block—having in it a passage D for gas to the pipe

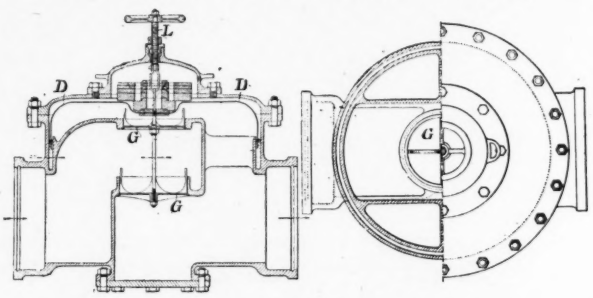


leading to the igniter E, and another (central) passage F for gas to the burner. Carried by a vertical spindle, mounted so as to be capable of moving up and down in guides (shown as discs, perforated for the passage of the gas), is a valve or hood I, presenting a comparatively large surface to the gas, and (when the gas is not turned on sufficiently to raise it) closing the passage for gas to the burner. When the gas-tap is first turned on to a small extent (which may be indicated by a spring-catch entering a recess, or by a pointer), the pressure is not sufficient to raise the valve or hood I to open the passage for gas to the burner; but gas passes by the passage D (which is open) to the igniter E, and is there ignited. When the tap is further turned, the pressure exerted by the additional quantity of gas admitted is sufficient to open the passage F for gas to the burner by acting on the valve or hood I, and so gas passes to the burner, and is there ignited by the igniter. The movement of the valve I thus effected acts by means of a disc (secured to the vertical spindle) on a valve J (mounted in the lower guide-disc), so as to close the passage for gas to the igniter, as shown in the right-hand figure; and the parts remain in this position as long as the lamp is burning. When the main tap is turned to extinguish the light, the valve or hood I descends, and closes the passage F for gas to the burner; and as the disc descends with the valve I, the valve J also descends and opens the passage D for gas to the igniter, ready for gas to pass to the igniter when the gas-tap is again operated.

Pressure-Regulator or Stop-Valve.—Tobler, A., of Paris. No. 6056; March 20, 1899.

This invention relates to apparatus adapted to act either as a pressure-regulator or as a stop-valve for gas-mains. It consists essentially of the combination with a floating bell-chamber and double-beat valve controlling the admission of gas to the bell (whereby to obtain a constant pressure) of a device for enabling the regulator to act as a stop-valve.

In the illustration—a vertical section of the apparatus, and a half plan, half longitudinal section—the bell D dips into a bath of mercury contained in an annular channel within the casing. The bell is fixed to the stem of a double-beat valve G, and is loaded with weights for regulating



the outflow pressure of the gas. The stem is connected by a link at its upper end with a shackle attached to a regulating-screw L, turning in a nut mounted in the cover, and operated by a hand-wheel. When the screw is in the lowest position, the valves will be removed from their seats and give passage to the gas, in which position the bell floats, and is free to rise and fall under variations of pressure; the links permitting freedom of vertical movement sufficient in extent to allow the valve to pass from the closed to the full-open position. By raising the screw until the valve is closed (as shown), the bell, which is also raised, will be rendered immoveable, and the flow of gas to the main shut off.

Regenerative Furnaces for Gas-Retorts.—Brearley, J. H., of Longwood. No. 7210; April 6, 1899.

These improvements in regenerative furnaces for heating gas-retorts comprise principally a new or improved construction of brick for building the dividing walls or partitions between contiguous flues or passages in the setting on each side of the furnace—one set of passages or flues being for the admission of secondary air to the combustion chamber of the furnace, for admixture with the furnace or producer gases to secure complete combustion; and the other set being for the discharge of the products of combustion, after circulation around the retorts, to the main-flue outlet—the secondary air entering and passing upward through the first set of passages, and being heated by the hot gases descending through the second set of passages.

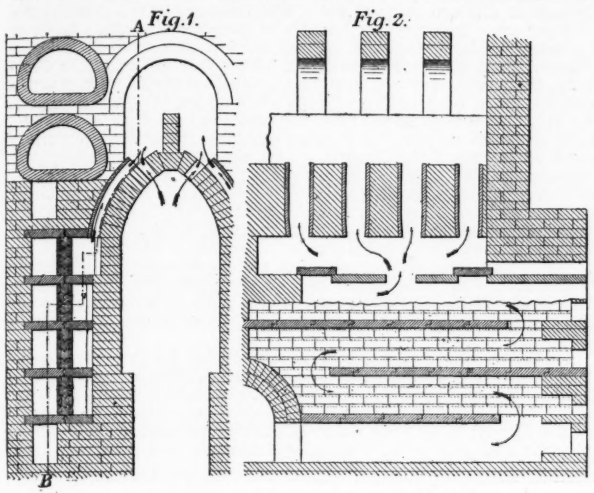
The special construction of brick for building the walls which divide the flues is "for the purpose of effectually preventing the contamination of the air and gases, or other elements or fluids passing through adjacent or contiguous passages by leakage from one to the other, whether resulting from cracks in the bricks, from defective joints between them, or from contraction or other causes." It consists in forming, near each longitudinal edge of each brick, a groove or recess of half circular or other suitable shape, which extends completely around the brick; while intermediate of the groove is formed on one face of the brick a V or other shaped longitudinal rib or projection, and on the opposite face a corresponding countersunk recess or opening. When laid, therefore, there is formed between each layer of bricks, and centrally thereof, a "baffle or dovetailed joint, which will prevent the passage of air or gases between the bricks." But in addition to this, fire-clay or other fire-resisting cement is applied between the faces and ends of the bricks, to fill in the half-circular grooves in each adjacent brick, thereby forming circular beads or ropes of fire-clay or cement completely around each brick on both sides of the centre, and presenting two additional sealed joints or baffles to resist the passage of air or gases through the joints of the walls.

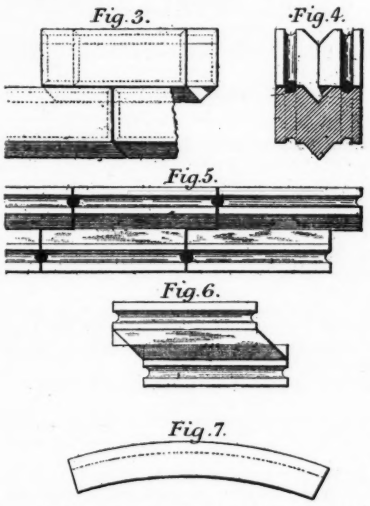
The ends of the bricks are cut out or recessed on opposing sides, to form overlapping or rebated joints with the ends of adjacent bricks—thus providing a third baffle to each end of the brick.

The heated secondary air is conducted from the secondary-air passages to the combustion chamber of the furnace through channels or U-shaped bricks, which are arched to the radius required to fit the producer arch; one end of the bricks or channels being preferably contracted to check the air sufficiently to admit of its being heated to the desired temperature in the air-inlet passages or flues. The combustion chamber for a portion of its height is also divided with a central wall or bridge, which "ensures a more thorough mixing of the air and gases in the

crown of the chamber, and gives better equalization of heat throughout the setting."

Fig. 1 is a transverse sectional elevation of so much of a regenerator furnace as is essential to show the application of these improvements. Fig. 2 is a part longitudinal section taken on line A B of fig. 1. Fig. 3 is an enlarged elevation of the improved bricks, illustrating the manner





of building them one upon the other. Fig. 4 is an end elevation of fig. 3. Fig. 5 is a plan view of the upper face of the bricks shown at fig. 3, illustrating how the bricks are laid and joined end to end. Fig. 6 is a plan view of the opposite or under-face of the brick. Fig. 7 is an elevation of the channel or U-shaped brick communicating between the secondary-air passages and the combustion chamber.

Washing Gas.—Guillaume, N. A., of Paris. No. 11,868; June 7, 1899.

This invention is more especially applicable to gas-washers working under suction. The gas enters in the form of a thin sheet in proximity to water falling as it is about to leave the apparatus; the gas subsequently rising and traversing the apparatus, down through which the water flows—the gas being directed into contact with the water by serrated hoods dipping into the water in troughs, "so that the gas is repeatedly washed as it passes upwards by water which passes downwards."

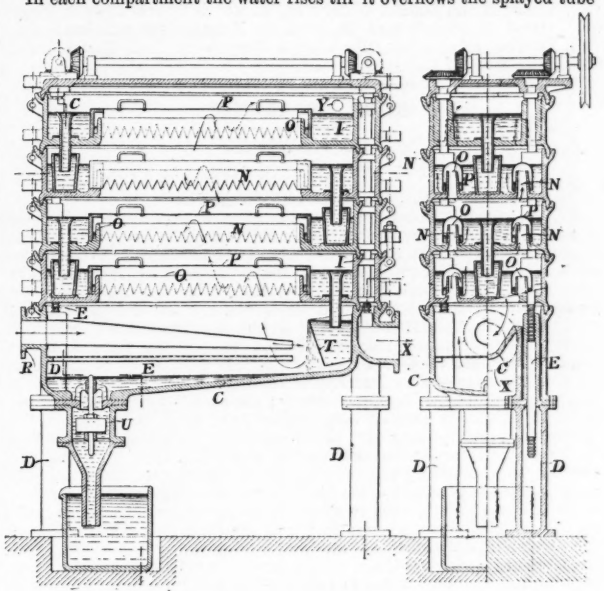
The apparatus (as shown) is constructed of a series of superposed rectangular troughs, fitting into each other by ribs on the one engaging with grooves on the other, and secured together by vertical bolts, or by joints giving a sufficiently tight closure. The lowermost trough C is mounted on columns D, extending up beside the troughs, and provided internally with screws E, the movement of which is controlled by bevel-wheels and a pulley at the top of the apparatus. In this way, the several troughs can be lifted or lowered so as to secure a uniform tightening of the joints.

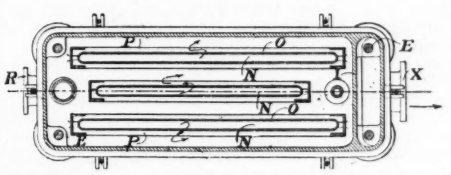
Each trough is divided by a partition I into two compartments, the smaller of which, when the troughs are superposed, constitutes a vertical conduit for the outlet of the washed gases, while the larger compartment is the trough in which the washing takes place. The troughs have each a splayed tube passing through the bottom, and a cup so arranged that the lower end of the tube is immersed in the water contained in the cup of the trough beneath. The gas enters each trough by several long and narrow openings N at bottom, with sides O rising into the trough; and over these hoods P are placed. These hoods have serrated lower edges, and are supported at their ends so that the serrations dip into the water in the troughs, and offer a gradual increase of area for the passage of the gas when the water-level in the hoods falls.

The lowermost trough is provided with a tubular entrance conduit R for the gas, extending into the trough, and being flattened out towards its end so that the gas passes from the conduit in the form of a horizontal sheet to meet the water which has served for washing the gas, and which overflows in a thin sheet from a box T situated before the incoming stream of gas. This lower trough has a sloping bottom; and the washing-water passes off at the lowest part through an outlet U provided with a float-valve. When the suction by which the gas is drawn in becomes too strong, this float-valve closes.

The water enters through a pipe Y in the upper trough—made flexible in order not to loosen the joint. The entrance for water to it is controlled by a float.

In each compartment the water rises till it overflows the splayed tube





already referred to, and passes through it into the cup beneath, which it overflows and passes into the next trough, and so from trough to trough till it overflows the box in the lowest trough in front of the incoming gas. The gas impinges against the water, and then passes through the openings in the trough and under the hood, and between the serrations and through the water that surrounds the hood. The gas thus successively passes through the water in each trough, and then descends in a washed condition through the vertical conduit formed by the smaller compartments constituting the gas-outlet—leaving the apparatus at X in the lowest trough.

APPLICATIONS FOR LETTERS PATENT.

2814.—Beak, W., "Gas or other engines." Feb. 13.
2834.—Hilliard, J. B., "Gas or air pump." Feb. 13.
2837.—Murrie, J., "Exhausters." Feb. 13.
2855.—Forbes, Sir C. S., "Acetylene gas-generators." Feb. 13.
2858.—Lake, H. H., "Fluid-meters." A communication from W. de Hertburne Washington and F. C. Goodwin. Feb. 13.
2888.—Naef, P., "Producing gas and bye-products." Feb. 13.
2917.—Naef, P., "Producing coke, gas, and bye-products, in part applicable for other purposes." Feb. 13.
2989.—Oehme, R., "Gas-stoves." Feb. 14.
3009.—Kemp, C. W., "Gas and other lamps." A communication from W. Fahndrich. Feb. 15.
3014.—Newark, J. E., "Sieves or grids used in gas-purifiers." Feb. 15.
3061.—Tuckfield, C., "Governor." Feb. 15.
3071.—Woodman, A. F., "Oil and gas engines." Feb. 16.
3093.—Lister, F., "Gas and like motor engines." Feb. 16.
3140.—Wynne, W. R., "Inlet and outlet valves of compound gas-engines." Feb. 16.
3181.—Sand, E. I., "Generating acetylene gas." Feb. 17.
3217.—Delin, G., "Obtaining intense heat by means of gas." Feb. 17.
3278.—Titchett, J., "Gas-stoves." Feb. 19.
3284.—Farmer, J. P., "Gas-burners." Feb. 19.
3312.—Richmond, E. W. T., "Gas culinary apparatus." Feb. 20.
3323.—Radclyffe, D. E., "Manufacture of fabric for illuminating mantles." Feb. 20.
3332.—Hicks, W. G., "Incandescent gas-burners." Feb. 20.
3385.—Linden, H. J. V., "Gas stoves or other apparatus." Feb. 20.
3391.—Stephens, R., "Gas-motors." Feb. 21.
3429.—Harrison, R., "Production of combustible gases from peat and similar substances." Feb. 21.
3465.—Jeffery, F. W., "Incandescent gas-burners." Feb. 22.
3509.—Gilman, J. T., "Gas-burner." Feb. 22.
3530.—Janz, J., "Incandescent bodies for illuminating purposes." Feb. 22.
3555.—Taig, J. B., T., & R., and Robertson, J., "Lighting street and other gas-lamps." Feb. 23.
3561.—Crossley, W. J., and Atkinson, J., "Internal combustion motors." Feb. 23.
3631.—Duff, E. J., "Gas-producers." Feb. 24.
3636.—Reid, W. W. D., "Gas and like cooking-stoves." Feb. 24.
3674.—Legge, J. St. C., "Incandescent lighting." Feb. 24.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following further progress was made with Private Bills last week:—

Bills read a second time: Bristol Water Bill, Dorking Water Bill, South Essex Water Board Bill.

Petitions were presented against the following Bills: Cleethorpes Gas Bill, Exmouth and District Water Bill, Exmouth Urban District Water Bill, Great Berkhampstead Water Bill, Kingston-upon-Thames Gas Bill, Newport (Mon.) Gas Bill, Walsall Corporation Bill, Westgate and Birchington Water Bill.

HOUSE OF COMMONS.

Tuesday, Feb. 27.

THE GASLIGHT AND COKE COMPANY BILL.

On the motion for the second reading of this Bill,

Mr. Pickersgill moved, as an amendment, that the Bill be read a second time that day six months. He explained that the Bill was to enable the Gaslight and Coke Company to increase their capital by £2,500,000; and it was identical with that of last session as amended in Committee. He opposed that Bill, and in the House of Lords it was rejected. He complained that the charges made by the Company for gas were excessive as compared with those of other Gas Companies; their rates having been constantly increased during the last ten years, notwithstanding the fact that the natural conditions were all in their favour. This was the largest Gas Company in the world; they had the most extensive and the richest district of supply; the quantity of gas they sold per mile of main was greater than that of any other Company in the Metropolis; and yet they were practising upon a very large number of working-class consumers something like a fraud, and at the same time avoiding their statutory obligations. He further opposed the Bill on the ground that the Company were showing something like contempt towards the House in having ignored every one of the five recommendations made by the Select Committee who last year inquired into the charges of the London Gas Companies. There was no necessity to give the Company power to increase their capital; and it would be a public advantage if they were empowered to sell their property on the south side of the Thames to the South Metropolitan Gas Company, so that the latter could, as they proposed in a Bill now before Parliament, undertake the whole of the gas supply in South London. In these circumstances, it was very desirable that the House should reject the present Bill.

Mr. Lough, in seconding the amendment, said that if ever there was a Bill which ought to be rejected before second reading, it was the present one. Through mismanagement and over-capitalization, the Company promoting it had imposed a great burden upon the whole population north of the Thames in respect of their charge for gas. As a matter of fact, the Company already had £1,000,000 of unexhausted capital, and this would be sufficient for the next two years at least. With regard to the proposed purchase by the South Metropolitan Company of the property of the Gaslight and Coke Company in South London, the former Company were willing to buy, and the latter willing to sell; the only question in dispute being as to the price to be paid.

Mr. Boulnois said if the honourable member for Bethnal Green (Mr. Pickersgill) had his way, he would not let Londoners have any gas, electricity, or water. He (Mr. Boulnois) maintained that it was impossible for the House itself to decide whether or not the charges made for gas by the Gaslight and Coke Company were fair; such a question could only be determined by a Select Committee after hearing evidence. He had no interest whatever in the Company; but he asked the House not to depart from the practice it had always observed in regard to industrial undertakings.

Mr. Banbury said that neither he nor his constituents were interested in the Company. He hoped, however, that the House would pause before it rejected a Private Bill before second reading unless it contravened—which he understood this Bill did not—some well-recognized principle on which the House proceeded.

Mr. Buxton pointed out that the promoters of the Bill had deliberately ignored the five recommendations made by the Committee of last year. Under the circumstances, if Committees were to be of any value at all, the second reading of the Bill ought to be rejected.

Sir J. Blundell Maple, as a large consumer of gas, supported the second reading. Consumers were in want of more gas, and unless the Company had more capital they could not supply it.

Mr. Cohen said he had no interest in the Company, but he advocated the second reading entirely for the benefit of the consumers, who had been too long sufferers by the management, or the absence of management, of the Company.

Mr. T. P. O'Connor supported the rejection of the Bill. He said that when the Committee of the House of Lords, who always extended the utmost consideration to commercial companies, felt compelled to reject a similar Bill last year, the argument against it must have been unanswerable. That Committee also recommended that if the Company came again to Parliament they should be compelled to reduce their price to that charged on the south side of the Thames—viz., from 2s. 11d. to 2s. 1d. per 1000 cubic feet. If the Company came before the House of Commons and said that if they received this power of enlarging their capital they would reduce their charge to that of the South Metropolitan Company, the House would willingly pass the Bill; but, in the circumstances, he hoped it would be rejected.

The House divided, with the following result: For the second reading, 184; against, 106—majority, 78.

The Bill was then read a second time and committed.

The following further progress was made with Private Bills last week:—

Bills read a second time and committed: Glastonbury and Street Gas Bill, Maidenhead Gas Bill, Mid-Kent Water Bill, South Metropolitan Gas Bill, Wandsworth and Putney Gas Bill.

Mr. Lough and Mr. Marks placed upon the paper for yesterday the following notice of motion in regard to the Gaslight and Coke Company Bill: "That it be an Instruction to the Committee to introduce clauses into the Bill to carry into effect the recommendations of the Select Committee on Metropolitan Gas Companies Charges (1899), as follows: (1) That the standard price should be reduced to 3s. 3d. to carry the standard dividend of 10 per cent., and that the existing scale of increase and decrease for dividend of ¼ per cent. for every penny of decrease or increase of price below or above 3s. 3d. be maintained, and that a secondary or additional scale be imposed which should permit of an increase or decrease of dividend over and above that regulated by the present scale of ¼ per cent. for every complete 3d. of decrease or increase below or above the standard price of 3s. 3d. (2) That the area south of the River Thames, at present part of the district of the Gaslight and Coke Company, should be transferred from the Gaslight and Coke Company to the South Metropolitan Gas Company; fair and reasonable price being paid. (3) That the charge made by the Gaslight and Coke Company for the rents of automatic meters and stoves should be the same to consumers north and south of the Thames for fittings of the same quality and capacity. (4) That capital powers should not be granted to any Gas Company for more than five years, if and when new capital is required. (5) That an effort should be made by any Company having obsolete or unproductive capital to redeem such capital by sinking fund or otherwise." The same honourable members also placed upon the paper for to-day a somewhat similar notice of motion in regard to the South Metropolitan Gas Bill—viz., to instruct the Committee on the Bill to insert such clauses therein as may be required to give effect to the first and second recommendations of the Select Committee of 1899, as above set forth.

A petition having been presented (after time) for the Llandrindod Wells Water Bill, the Examiner reported non-compliance with Standing Orders; and his report has been referred to the Standing Orders Committee. A petition was presented too late against the London Water (Welsh Supply) Bill, by the Duke of Beaufort; but application has been made for a suspension of the Standing Orders in regard to it.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Feb. 28.

(*Before Mr. Justice* Buckley.)

The Welsbach Incandescent Gas-Light Company, Limited, v. The New Sunlight Incandescent Company, Limited.

This was the motion opened before Mr. Justice Byrne on the 23rd ult., and adjourned by him to be heard by Mr. Justice Buckley, who had tried the action in which practically the same parties were concerned (*ante*, p. 547).

Mr. Moulton, Q.C., Mr. T. Terrell, Q.C., and Mr. Walter appeared for the plaintiffs; Mr. Bousfield, Q.C., and Mr. Neill represented the defendants.

Mr. Moulton having stated that the motion was for an interim injunction against the successors in business of the Company against whom he had recently succeeded in establishing the validity of the plaintiffs' 1886 patent,

Justice Buckley asked when the patent would expire.

Mr. Moulton: On the 12th of March.

Justice Buckley asked if Counsel could seriously apply for an interim injunction for twelve days. Why did plaintiffs not join defendants in the original action?

Mr. Moulton said they were not in existence when the writ was issued. If they had been joined afterwards, when full information was given, it might have delayed the trial.

Justice Buckley said that was merely formal. He did not suppose it would have delayed the trial a day. He must hear the motion, if it was pressed; but he had no expectation that Counsel would persuade him to grant an injunction for twelve days.

Mr. Bousfield remarked that the plaintiffs began an action against the New Sunlight Company in respect of the same mantles in July last; but they chose to confine it to their later patent.

Mr. Moulton said defendants were still selling these mantles.

Justice Buckley said they would be entitled to make and sell them in a few days, so far as the 1886 patent was concerned. It was only a question of damages. One of the grounds on which he declined to grant an injunction in the other case was that it would, in effect, have been against the present Company, who were not parties to that action, though individuals connected with it were defendants. If Counsel insisted, of course he would hear it.

Mr. Moulton said at any rate the defendants ought to undertake to keep an account.

Mr. Bousfield said that an undertaking had already been given in the other action.

Justice Buckley said, on the defendants undertaking to keep an account, there would be no order on the motion, except that the costs should be costs in the action.

The Incandescent Gas-Light Litigation.

In the Court of Appeal, on the 26th ult., before Lords Justices Smith, Collins, and Romer, the Voelker Incandescent Mantle Company, Limited, appealed from an order made by Mr. Justice Day, in Chambers, on Dec. 21 last, granting an injunction restraining them from infringing the 1886 patent of the Incandescent Gas-Light Company, Limited. Mr. Bousfield, Q.C., and Mr. Neill appeared for the appellants; Mr. Moulton, Q.C., Mr. T. Terrell, Q.C., and Mr. Walter represented the respondents. Mr. Bousfield had scarcely opened the case—submitting that it was not usual to grant an injunction on a summons without any opportunity of going into the matter, and stating that the appeal was made immediately, though the action had not come into the paper until now—when their Lordships suggested that, as the patent in question had only about a fortnight to run, it was hardly worth while to interfere now, even assuming the appellants were right, as the mischief had practically been done. What might happen during the coming fortnight would only add to the damages they would be entitled to recover if they succeeded at the

trial. Mr. Bousfield said he felt the force of this suggestion; but as his clients were not present, he could hardly consent. Lord Justice Smith said the Court would order the appeal to stand over until after the trial; the costs of the injunction and of the appeal to be reserved.

Conviction for Assault on Welsbach Company's Inspectors.

At the Thames Police Court, on Saturday, the 24th ult., Benjamin Benjamin, who refused to give any address, was charged with assault upon, and threatening to shoot, Daniel William Barnett and James Cox inspectors in the service of the Welsbach Incandescent Gas-Light Company, and also with assaulting two police constables. From the facts of the case as narrated by the Solicitor for the prosecution, an injunction was granted on Dec. 16, 1897, against certain persons trading as the Excelsior Incandescent Light Company, of 166, Mile End Road, E.; the accused and his son (Isaac Benjamin) being two of the defendants to that action. Evidence was given that, Barnett having served on Isaac Benjamin an order of the High Court appointing a Receiver to take possession of all mantles and appliances infringing the patents of the Welsbach Company, and also giving the Company possession of all documents relating to any such infringements, the prisoner Benjamin Benjamin violently assaulted Barnett and Cox, and threatened to shoot them. The constables who were called were also assaulted by the prisoner, and a revolver loaded with two ball and two shot cartridges was taken from him after a severe struggle. Having heard the evidence, Mr. Dickinson fined the prisoner £3, or one month's hard labour, in each instance, for the assaults upon Barnett and Cox, and £2, or one month's hard labour, for the assault upon each of the constables; making in the aggregate a £10 fine, or four months' hard labour—the sentences of imprisonment being ordered to run consecutively. Prisoner was also bound over in the sum of £25 to keep the peace for twelve months.

The Charge of Falsifying Books and Embezzlement.

At the Lambeth Police Court last Wednesday, before Mr. Hopkins, Mr. F. F. Norris appeared to further answer the complaint that he, being an officer employed by the Directors of Frank Wright's Prepayment Gas-Meter Corporation, Limited, did on various dates "unlawfully, wilfully, and with intent to defraud, alter and falsify certain books of account belonging to his employers." There was also a summons against the defendant, who was formerly the Secretary of the Company, for embezzling money received by him on account of the Directors. Mr. Wontner appeared in support of the summonses; the defendant was represented by Mr. H. I. Sydney. The case on behalf of the Company was opened on the 21st ult. (*ante*, p. 548); and the evidence of one of their clerks was now taken at some length. It had reference to the Company's accounts, and was directed to showing the manner in which the defendant was alleged to have dealt with moneys received by him on the Company's behalf. At the close of the examination-in-chief of the witness, Mr. Hopkins said he should on this occasion require the defendant to find bail. Mr. Sydney expressed the hope that his Worship would not insist upon bail being furnished at this hearing. The defendant, he pointed out, was not required to find bail upon the last occasion, and had not anticipated being called upon to provide it that day. He reminded his Worship that all the issues in the case were raised in an action which had been commenced in the High Court of Justice at the instance of the defendant's wife. Mr. Hopkins, however, said he must adhere to his decision, and, in adjourning the further hearing for a week, said the defendant would have to find a surety in £250, or two sureties in £125 each, for his appearance.

The Payment of Water-Rates for Small House Property.

At the Stockport County Court last Friday, before his Honour Judge Yate Lee, an estate agent named Joseph Albiston sued Edward Dixon for £3 12s. 6d., money alleged to be due by defendant to plaintiff in respect of the water-rate of the premises No. 275, Heaton Lane, Stockport. It was mentioned that the case would be a test one in regard to the other tenants of the plaintiff, who were in a similar position to Dixon. It appeared that in 1893, up to which time the tenants had paid the water-rate, the Water Company gave the plaintiff notice that he must himself pay the rate for the whole of his houses, instead of the money being collected from individual tenants. The plaintiff did so, and it was submitted that he was entitled to get the money from the tenants. It was mentioned that he had not claimed before because he had asked Dixon for the amount from time to time. The rates had accumulated against Dixon from 1893 to 1899, until they reached the sum claimed. For the defence, it was argued that, under the Act of Parliament, the landlord was liable to pay the rates of £10 houses; being, of course, entitled to recoup himself by placing a proportionate increase upon the rent. His Honour agreed with the defence set up, and gave a verdict for the defendant; awarding increased costs on the ground that the case was one of interest to the general public.

Increased Consumption after Reduction in Price.—Two years ago, a proposal was adopted in Berne to reduce the price of gas 12 per cent. Some of the residents regarded this step as being financially dangerous, and they predicted a heavy deficit. The result proved them to be wrong. After the decrease in prices, the consumption of gas increased 13½ million cubic feet in 1897, and 14 millions in 1898. Moreover, the financial equilibrium, temporarily disturbed, was speedily restored; and now there is an increase in the revenue. The same happened in the case of the supply of electricity. After reducing the prices, the communal electric light works had an increase of business. The profits in 1892 were 10,120 frs.; whereas in 1898 they were 38,882 frs. There was also a rise in the receipts for water. At present, gas, electricity, and water are the most important sources of revenue for Berne.

MISCELLANEOUS NEWS.

SOUTH LONDON LOCAL AUTHORITIES AND THE SOUTH METROPOLITAN GAS BILL.

Conference at Camberwell.

A few weeks ago, the Camberwell Vestry convened a conference of South London Local Authorities to consider the advisability of taking joint action with respect to the Bill promoted by the South Metropolitan Gas Company in the present session. The conference took place in the Vestry Hall, Peckham, on Monday evening last week, under the presidency of Mr. E. P. Phillips, J.P., Chairman of the Vestry. The following Local Authorities sent delegates: Battersea, Bermondsey, Camberwell, Newington, Rotherhithe, St. George-the-Martyr, and Wandsworth. Invitations were sent to Greenwich, Lambeth, Lee and Lewisham, St. Olave's, and St. Saviour's; but these parishes did not appoint delegates. The documents submitted to the conference included the statement prepared by Mr. George Livesey, which was published in the "JOURNAL" for the 20th ult. (p. 482), and the following opinion of Mr. G. M. Freeman, the Counsel employed by the Camberwell Vestry:—

My opinion is asked as to whether consumers south of the Thames will be prejudiced by the Company obtaining the powers asked for, and also whether local authorities can be affected in regard to the charges for street lighting. It is therefore necessary to consider the various parts of the Bill separately. First, as to varying the standard of illuminating power. The opinions expressed by the Chairman of the Company, that the reduction or increase of illuminating power within a certain range is immaterial because the control really rests with the consumer, and depends mainly upon the burner used, and also that all enrichment of gas is done at the expense of the consumer, are held by many gas experts, and are, in my opinion, true. This seems a good reason for allowing a reduction of power by one, or possibly two, candles, as has been frequently done by Parliamentary Committees. But I think the proposal to have varying charges in the same district is objectionable in the interests of consumers, because it would leave it in the hands of the Company to supply such quality as they chose at varying times and in different parts of their district, and, moreover, as presumably consumers would be charged on an average, persons only receiving 14-candle gas might be contributing to the payment of persons receiving 16-candle gas. I think the clause should be amended either by simply reducing the illuminating power to 15 candles, with a standard price of 3s. 2d., or providing that the illuminating power shall be the same for all parts of the district. I do not think this affects the local authority in respect of their public lamps, as they can determine at which power and price they will take the gas, providing that a condition is put in the Bill that the Company shall at all times furnish for the public lamps gas of such illuminating power, not exceeding 17 candles, as the local authority require, and such supply shall be separately tested. I do not think the corresponding variations of dividend are objectionable. Secondly, as to the purchase by the Company of part of the undertaking of the Gaslight and Coke Company. It is important that the Company should not be entitled to charge higher prices, whether to private consumers or local authorities, than they are entitled to charge in their present district. I think that this is practically provided for by clause 25 (2) of the Bill, but that it would be desirable, after the words "supply of gas" in clause 25, line 31, to insert the words "and to the charges to be made for such supply, whether for public lighting or private consumption." The only other way in which the proposed sale could affect the local authority would be in case they had any intention of themselves becoming purchasers of the portion of the Gaslight and Coke Company's undertaking south of the Thames; but I do not understand that this is contemplated. Otherwise the sale would be for the benefit of all consumers, as the charge for supply would be lower.

Mr. SETH COWARD (Camberwell) moved the following resolutions:—

(*a*) That, in the opinion of this conference, it is desirable, in the interests of the authorities whose areas are affected by the Bill, that the Bill should be opposed, in order that necessary amendments may be obtained.

(*b*) That Parliamentary Agents and Counsel be engaged against the Bill, and that the cost of the opposition be shared by the authorities represented at this conference.

(*c*) That the several authorities whose areas are affected by the Bill be requested to urge the local Members of Parliament to support the amendments desired by the conference.

(*d*) That a copy of the resolutions passed by the conference be forwarded to the Board of Trade, the London County Council, the Metropolitan Vestries and District Boards south of the Thames, and the London Members of Parliament for the district affected by the Bill.

He argued that these resolutions were necessary in the interests of the consumers.

Mr. W. WESTCOTT (Newington) seconded the motion.

Mr. H. G. HILLS (Vestry Clerk of Wandsworth) said that, in his opinion, the most important clause in the petition which had been drafted was the following: "That your petitioners humbly submit that the proposal to have varying charges in the same districts is objectionable in the interests of consumers." He moved, as an amendment, that the clause should be altered so as to read: "That, in the opinion of this conference, the proposal to have various charges in the same districts is objectionable in the interests of consumers."

Mr. J. H. GIBSON (Wandsworth) seconded the amendment.

Mr. J. SOMERVILLE (Camberwell) said the kernel of the Bill was contained in the clause to which attention had been drawn. The Bill did not propose varying charges. The main object of the Company was to enable them to use for gas making Newcastle coal alone, without any enrichment. The gas supplied by the Company was the cheapest in London. If the Bill were not permitted to go through, the inevitable result would be that the Company would be compelled to raise the price of their gas in order to meet the increased cost of production. They were now in such a financial position that they could take many thousands a year out of the pockets of the people of South London without depriving the shareholders of a single penny of dividend. He could not imagine how Counsel had fallen into the error that the Bill intended to introduce varying charges in different districts. Such a thing was manifestly absurd. It was also an error to imagine that the Company desired to adulterate their gas. What they really wanted to do was to supply unenriched gas. Why did consumers want enrichment? The incandescent gas system had been introduced into their streets; while, as far as

private consumers went, the illuminating power, within a range of two or three candles, was practically of no importance. It was all a question of burners, over which the Gas Company had no control. Of course, all experts agreed that the enrichment of gas used for power or manufacturing purposes, or for cooking or heating in any form, was waste of money. In South London, there were in operation an enormous number of gas-stoves; and if the cheapest form of enrichment—namely, by the admixture of carburetted water gas—were resorted to, the effect would be to reduce the heating power of the gas. This was a matter to be seriously considered in the interest of the consumers. It must not be imagined that he "held a brief" for the Company; he had never seen Mr. Livesey, the Chairman, in his life.

Mr. W. Matthews (Battersea) said he did not desire to throw any imputation upon Mr. Somerville; but if he did not "hold a brief" for the Company, and had not been "coached" by anyone, he seemed to have got a very large amount of information upon the subject.

Mr. Somerville [holding up a number of the "Journal"]: This is where I get my information. I have studied this paper for years. He went on to say that what was required in South London, with its 50,000 ordinary gas-stoves, was not an illuminating, but a heating gas, with a higher incandescent power. Instead of opposing the Bill, they should support it, not only in the interests of the people on the south side of the river, but for the whole community. If the Bill passed, the Companies in North London would be obliged to follow suit.

Mr. A. Purser (Rotherhithe) said what they wanted in his district was more efficient testing-stations. Within the small area of Rotherhithe they had different illuminating powers.

Mr. Matthews said the Company ought to supply private consumers with good burners.

Mr. Somerville: Perhaps they will.

Rev. J. H. Anderson (Wandsworth) advocated caution in coming to a conclusion.

Mr. C. E. Hearson (Camberwell) followed on the same lines as Mr. Somerville, and strongly argued that the local authorities should support the Bill in the interests of the consumers.

The delegates from Bermondsey, Newington, Battersea, and St. George-the-Martyr advocated that a petition should be lodged, in order that the local authorities might secure *locus standi*. In the result, Mr. Coward temporarily withdrew his series of resolutions. Mr. Hills's amendment was then put in the form of a motion, and carried with one dissentient (Mr. Somerville).

Mr. Somerville explained that he had only voted against the motion because there was not in the Bill any proposal to have varying charges in the same districts.

Mr. Coward's series of resolutions were then taken *seriatim;* and the first was adopted.

Mr. Coward moved that the conference adjourn, and that Mr. Livesey be invited to attend the adjourned sitting, in order to see if any arrangement could be come to.

Mr. Gibson seconded the proposal.

Mr. Matthews strongly objected. If they invited Mr. Livesey, he was such an exceedingly able man that he would talk them into agreeing to what he wanted them to do. (Laughter.) He was perfectly serious; and, in the interests of weak-kneed delegates, he wished to save them from the risk of being induced to give their countenance to a Bill which, in his opinion, was nothing less than an attempt to exploit the people.

Mr. T. Haynes (St. George-the-Martyr) mentioned that his Vestry had already petitioned against the Bill.

Mr. Somerville said he wished earnestly to support Mr. Coward's proposal. It was to be observed that there was a great deal of misapprehension about the matter; and it was most desirable that Mr. Livesey should be afforded an opportunity of dissipating it. Nothing could be more absurd than to describe the Bill as "an attempt to exploit the people." A good many of those present did not know what they were opposing.

The motion was negatived.

After some discussion, the three remaining resolutions were adopted; and it was decided to instruct Parliamentary Agents.

Rev. J. H. Anderson moved—"That this conference is of opinion that the Metropolis should be provided with gas of a uniform quality and price throughout." He said that in his district (Wandsworth) there were several Companies, some of whom the residents did not consider treated the public fairly.

The Chairman ruled the motion out of order.

Mr. Somerville dre wattention to the London County Council Gas Bill, and said he thought the conference should express some opposition to the proposed introduction of a moveable photometer.

The Chairman ruled that the conference had no power to discuss any Bill other than that of the South Metropolitan Gas Company.

A vote of thanks was accorded to the Chairman; and the proceedings closed.

ACQUISITION OF THE PORTLAND GAS-WORKS BY THE DISTRICT COUNCIL.

A Transfer Effected Without Arbitration.

The Urban District Council of Portland have within the past five months accomplished a feat which we believe to be unique in the history of the municipalization of gas undertakings. They have acquired from a private owner the gas-works supplying the Island, and have done this without an expensive contest in Parliament or the assistance of two arbitrators and an umpire. The circumstances under which the transfer has taken place are as follows.

At a meeting of the District Council on the 11th of October last, the following resolution was proposed by the Chairman (Mr. J. Lano), seconded by the Vice-Chairman (Mr. B. Comben), and carried unanimously: "That it is the opinion of this Council that they should control the supply of gas and electricity on the Island; and that a Committee be appointed to negotiate with the Portland Gas Company with the view of ascertaining upon what terms the Portland Gas-Works can be acquired." It was then resolved that the Committee should consist of the Chairman, Vice-Chairman, and Chairman of the Finance Committee (Mr. G. H. Smith). These gentlemen had an interview with Sir Richard Howard, the owner of the works, and informed him that the Council were anxious to acquire them, if they could do so on reasonable terms, as they believed it would be of advantage to the inhabitants to have the public lighting of the district under their management. Sir Richard informed the Committee that he believed in public authorities having control over the gas and water works within their district; and therefore he should be prepared to favourably consider any proposition which the Committee might put forward for acquiring his works. The Committee asked Sir Richard whether, having regard to his experience, as the former Clerk to the Council and as the present Town Clerk of Weymouth, in matters of municipal finance, he considered the price he would be prepared to accept would be of such a reasonable character that it would be unnecessary to come on the rates for any portion of the annual instalments of principal and interest. He informed them that he would be willing to accept such a sum as would render it unnecessary to do so; and that he believed the present net income to be derived from the works would be sufficient to meet all those instalments—in other words, that the works would pay for themselves. In answer to a further question, he informed the Committee that he was quite prepared for an expert gas engineer to examine the works and investigate his books, &c.; and that, if a reasonable report were made by such valuer on behalf of the Council, he would probably accept it, and in that event it might be unnecessary for him to call in a valuer. The Committee considered that their interview with Sir Richard was of a very satisfactory character; and therefore, on the 13th of December last, in their report on the result, they recommended the Council to at once appoint an engineer to examine the works and accounts, and state what would be a proper sum to offer for the undertaking. With the view of assisting the Council in the matter, the Committee requested the Clerk (Mr. J. Howard Bowen) to communicate with their Parliamentary Agents (Messrs. Baker, Lees, and Co.), and request them to submit the names of some gentlemen qualified to make the valuation. In the result, the Committee advised that Mr. W. A. Valon should be appointed, and be requested to visit Portland at once, so that an agreement might, if possible, be come to by the end of January. The report was adopted, with one dissentient.

Mr. Valon promptly paid a visit to Portland, and, in company with the Council's Surveyor (Mr. E. J. Elford), examined the works, inspected the district, and subsequently presented his report and valuation. On the 10th of January, the Committee informed the Council that there were certain matters upon which they required further information; and they were therefore authorized to meet Mr. Valon. This they did, and on the 2nd ult. they presented another report. Mr. Valon also sent in a long report dealing fully with the structural condition of the gas-works and the character of the district to be supplied. It closed as follows: "The conclusion I have arrived at with regard to the works is that they are generally well built and substantial; that the retort-house is in excess of present requirements; that the gasholders (when the new one is completed) will be considerably in excess; that the condenser, scrubber, and washer require adding to; and that, while the purifiers are sufficiently large for the present make, it would be decidedly economical to put up an additional one. Further, that it would be good business to erect sulphate works for the manufacture of sulphate of ammonia on the premises; this article being now in fair demand for agricultural purposes, and likely to continue so. In other words, the excess plant, together with the site on which it stands, is more than a set-off against the deficiencies in scrubbing, condensing, and washing power; while the sulphate works will pay for erection. As regards the district, the mains require an expenditure to give them a proper overhauling and lay them deeper in the ground, which would considerably reduce the leakage, and at the same time render them safe for the future. The pipes themselves, I think, are in good condition; and nothing more than I have stated will be necessary to put them in good order. For the year ending Sept. 30, 1899, the quantity of coal carbonized was 1700 tons; the quantity of gas made, 16,204.100 cubic feet; the gas accounted for, 13,943,300 feet; the gas sold, 13,568,300 feet. From the accounts for receipts and expenditure furnished by the Manager, which have been verified, and after adjusting the various items as between capital and revenue, I am of opinion that the undertaking of the Portland Gas Company—including works, plant, buildings, mains, meters, gas-stoves, stock-in-trade, tools, implements, and goodwill, and all and every the interest of the proprietors (excepting coal in the stock or gas manufactured and stored in the gasholders), is to be valued at the inclusive sum of twenty-eight thousand six hundred and fifty-six pounds (£28,656), this sum to include the amount to be expended by the proprietors for the erection and completion of the new gasholder; the holder, tank foundations, connections, &c., to be completed to the satisfaction of the Council's Engineer, and subject to his certificate."

The two reports were discussed together by the Council at a meeting held on the 9th ult., and the matter adjourned till the 12th ult. Mr. Valon was unable to attend on that day; but he sent certain details of income required by the Council, accompanied by the following explanatory remarks: "The gross income is £3826 0s. 9d.; while the expenditure, adjusted for the repair and maintenance of works, &c., is £2388 9s. 11d.—leaving a gross profit of £1437 10s. 10d. My valuation of the above is £28,656 10s. The annual amount to be invested at 3 per cent., together with sinking fund, to reproduce the principal of £28,656 in 40 years would be £1241 15s. 2d., or in 50 years (which I think it is more likely the Local Government Board might be induced to grant) £1114 14s. 4d. If for 40 years, the balance of profit on the adjusted accounts as they stand would be £195 15s. 8d.; and if for 50 years, on the second amount of £1114 14s. 4d., £322 16s. 6d. The carbonizing accounts show, however, that the gas sold per ton of coal carbonized is only 8000 cubic feet. This, as I pointed out to the members I had the pleasure of seeing when at Portland, should be considerably over 9000 cubic feet. Taking it, however, at 9000 feet, it means 1000 cubic feet per ton of coals carbonized, or an additional profit of £250. There should also be made from the manufacture of sulphate of ammonia a profit of £85. These two sums together give £335. If this be added to the balance of profit in the case of 40 years, it means a balance on the right side of £530 15s. 8d. per annum; and if for 50 years, £657 16s. 6d. per annum. This amount of profit, therefore, would fully justify the Council, as I have already recommended the

Committee, in reducing the price of gas 6d. per 1000 cubic feet, which would still leave them a balance on the right side, without calculating the increase of consumption which would be the natural result of the reduction made."

A special meeting of the Council was held on the 20th ult., at which Mr. Valon was present. After a long consultation, it was resolved, with one dissentient—"That the Committee be instructed to make Sir Richard Howard an offer of not exceeding £28,656 for the Portland Gas-Works, and, if accepted, to arrange with him the details of an agreement for the purchase of such works, to be sealed by the Council at their next meeting; such agreement being in all respects subject to the consent of the ratepayers being obtained." The Committee met Sir Richard on the 22nd, finally agreed with him for the purchase of the works for the amount stated by Mr. Valon, and provisionally settled the terms of the contract for purchase. A full representative meeting of the ratepayers was held last Tuesday (Mr. Valon being present as adviser to the Chairman); and it was unanimously resolved to endorse the policy of the Council and the offer they had made. The Council will now be able, by promoting a late Bill, to obtain parliamentary sanction to the agreement this session; Lord Morley having already promised to give permission for the introduction of the Bill, which will pass through its various stages in both Houses as an unopposed measure.

BELFAST CORPORATION GAS AFFAIRS.

How a Loan to the Electric Lighting Committee is being Dealt with—The Price of Coke.

There seems to be a little juggling going on at Belfast with money which the Corporation Gas Committee advanced to the Electric Lighting Committee in the hour of need; and the cool manner in which the loan is being dealt with by the Electric Lighting and Finance Committees was exposed by Mr. Young at the meeting of the Council on Thursday during the consideration of the estimates for the year. Mr. Young said that in the estimate of the Finance Committee there was an item: "Deduct contribution from Electric Light Committee, £5090." In the Electric Light Committee's report, they found the explanation of that which he thought the public should be put in possession of: "Resolved—That the principal Committee be recommended to transfer to the Finance Committee in aid of the rates the sum of £5090 16s. 3d., being the equivalent of the interest and sinking fund to Dec. 31, 1899, on £32,500 capital expended on which this Committee has not heretofore contributed the interest or sinking fund." Not a word so far about the Gas Committee; and, said Mr. Young, to find out how the Committee got hold of the money, they had to turn to the gas accounts. There it was found that the money was advanced out of the surplus profits of the Gas Committee a great many years ago; and up to the present they had obtained neither interest nor anything else for it. What he complained of was that this £5090 was going to the Finance Committee to the relief of the rates of the city, whereas, if it had been given back to the Gas Committee, it would have gone to the relief of the gas consumers, who should receive the benefit in the form of a reduction in the price of gas. He strongly advised the Gas Committee to be very slow in future to advance any more money to any of the Committees; and, if they had a surplus, to use it in a legitimate way by reducing the price of gas and coke.

On the same occasion, the minutes submitted by the Gas Committee contained a report by Mr. J. Stelfox, the Manager of the gas-works, in regard to the price of coke, and also a resolution of the Committee adhering to a previous determination to fix the price at 5d. per bushel. Mr. Young, in moving the confirmation of the minutes, said at the last meeting of the Council a question was raised regarding an increase of 1d. in the price of coke. It was decided that Mr. Stelfox should report on the matter; and this he had done. The report showed that this year they were paying for coal £8500 in excess of what they paid last year, and it was estimated that, owing to the increased price of coal, if they had now to make a contract, they would have to pay from £27,000 to £38,000 in excess of last year's rates, in addition to the £8500. There was no increase put on the price of coke until November, when the stock was thoroughly exhausted; and it was then raised to 4d., and still they had not sufficient coke to supply the demand, so that they raised the price another penny. This penny meant to the ratepayers a sum of £10,000 a year if they took that off. It was said that this was depriving the poor of the coke. Before the Committee increased the price, they issued 150 circulars to the consumers of coke, and only one consumer—and a very small one—objected to the price charged. Every one of the large consumers agreed to it, and asked to be supplied with as much coke as they could give. The coke sold for the week ended Feb. 13 amounted to 49,626 bushels. Of this, there was disposed of to large consumers on credit 30,548 bushels, and of the remaining 19,078 bushels 16,142 were sold to private consumers occupying large houses. The persons of the humbler classes who applied only took 2936 bushels out of the 49,626 bushels. No person who went to the gas-works to get coke was refused; and the poor consumers obtained it in preference to the large ones. They had stopped the sale of coke to any person outside the city. Mr. Liddell moved, as an amendment, that the portion of the minutes referring to the price of coke be sent back to the Committee; but this was defeated by seven votes to nineteen.

Installation of Inclined Retorts and De Brouwer Plant at Wakefield.—The Directors of the Wakefield Gas Company have decided to adopt a complete installation of the De Brouwer coke-conveying plant in connection with the settings of inclined retorts now in course of erection at their works; and they have placed the order with Messrs. W. J. Jenkins and Co., Limited, of Retford. The Directors are having nine beds of these retorts put up, each consisting of eight retorts 26 in. to 22 in. by 16 in., and 20 feet long, the contract for which has been let to Messrs. Jonas Drake and Son, of Halifax. When finished, the whole will form one of the most complete installations of inclined retorts in the country. It has been designed by, and is being erected under the supervision of, Mr. H. Townsend, the Company's Engineer and Manager.

DARLINGTON CORPORATION GAS SUPPLY.

Increased Storage Required.

At the Meeting of the Darlington Town Council last Thursday, the Gas and Electric Light Committee presented a report in which they recommended that Mr. Charles Hawksley be requested to ascertain if the various firms who submitted, during the year 1897, tenders to erect the proposed gasholder were now willing to undertake the work at the prices quoted in the respective tenders, or, if not, what was the amount of increase. In moving the adoption of the report, Alderman Barron said the Council would probably remember that some years ago he ventured to point out that their storage was not sufficient to cope with the demand for gas. Two or three years ago the matter came up, and the Council decided that it should be deferred. He should like to tell the gentlemen who were responsible for the decision that they were now close upon a possible short supply of gas for their customers, and that the gasholder, the erection of which they were compelled to take into serious consideration, would cost from £6000 to £10,000 more than it would have done if the contract had been let when the Committee recommended it to the Council. They felt the time had arrived when the gasholder should be erected; and this was the meaning of the recommendation. Mr. Bartlet inquired as to the approximate date on which the electric light would be supplied to the town. It would be a serious thing for the Council to spend a large sum of money if it could be staved off for a couple of years till prices returned to their normal condition. Alderman Sedgwick said it seemed to him that if they had been able to get along for the last two years, they might do so until they saw how far the electric light would affect the gas supply. Mr. Gunter opposed. They might wait, he said, till they saw the effect of the electric light. Mr. Harbottle characterized the recommendation as somewhat of a joke, for if the Committee knew of the vast increase in the price of material, why were they going to the tendering firms to see if they would do the work at the prices they had stated? They were now told the same story as before—that the work was imperative; and this on the eve of the electric lighting plant being put down. Alderman Barron, in reply, mentioned that since June, 1897, when the subject was before the Council, they had put two or three miles of mains in the streets. Certainly, £30,000 was a large expenditure, and they would shrink from it were it not absolutely necessary. Up to the end of last year, the augmentation in the consumption of gas was between 9 and 10 per cent. Three days in succession, in the present year, the increase over the corresponding period of last year was more than 30 per cent. The Committee placed the responsibility on the Council. They must not look to the electric light as a panacea. Their storage at present was not more than half-a-day's supply; and they knew what this meant. If the manufacturing plant broke down, the town would be without gas. As to the electric light, their contracts were made for the provision of a supply of current about August or September—at any rate before next winter. The report was adopted.

LONGTON CORPORATION GAS SUPPLY.

The Past Half-Year's Working—The Coal Supply Difficulty.

At the Meeting of the Longton Town Council last Thursday, the half-yearly accounts of the gas undertaking were submitted in the minutes of the Gas and Electricity Committee. They showed a net profit of £1014, after payment of instalments of the principal and the interest on loans. The output of gas for the previous four weeks showed an increase of 2,506,000 cubic feet over the corresponding period of last year; while 106 slot meters and 21 stoves were fixed—making a total of 2777 slot meters and 863 stoves now in use. In moving the adoption of the minutes, Alderman Bakewell, referring to the profit on the half year, said it reflected great credit on their Manager (Mr. W. Langford), considering the very high price of coal, and the many difficulties he had to contend with. Alderman Leak concurred. Personally, he wished to say how pleased he was to observe the realization of a profit on the gas-works. Mr. Preece spoke in a similar strain, and went on to say that at a recent meeting of the Council it was stated that the contractors were not fulfilling the terms of their contract in regard to the quantity and quality of the coal, and reference was made to penalties. Certainly something ought to be done to make the contractors keep to their contract. Further, he had noticed an employee from the gas-works travelling by rail nearly every morning; and, on inquiring as to the nature of his business, he was informed that this man had to go and look for coal, or the works would not go on, the supply was so unsatisfactory. They should at least make the defaulting contractors pay that man's wages and expenses. In reply, Alderman Bakewell said it was quite an open question as yet what they were going to do; but it might be left to the Gas Committee, who were endeavouring to do the best they could in the matter.

THE ROTHWELL DISTRICT COUNCIL AND THE GAS-WORKS.

Local Government Board Inquiry.

At the Council Chamber, Rothwell, on the 23rd ult., Mr. H. P. Boulnois, M.Inst.C.E., held an inquiry relative to an application by the District Council for a Provisional Order to acquire the undertaking of the Rothwell Gas Company and to maintain, continue, enlarge, and improve the works when acquired; and for permission to borrow a sum of £13,000 to defray the cost, and a further sum of £2000 for necessary extensions. The Clerk to the Council (Mr. F. W. Bull) stated that when the Gas Company were approached, it was found that they were not unwilling to transfer the undertaking if satisfactory terms could be arranged. The Council then called in an expert to value the property and to advise them whether or not it would be desirable to proceed further with the matter. Mr. Corbet Woodall therefore inspected the works on the 24th of April last, examined the books, and interviewed the officials. Mr. Evan Barlow, the Company's Solicitor, who watched the case on their behalf, pointed out that they had no part in the engagement of Mr. Woodall, but when that gentleman arrived it was arranged that he should act for both sides. Mr. Bull went on to say that Mr. Woodall made his report on

June 5, 1899; and it was upon it that further proceedings were taken. He gave it as his opinion that the undertaking was worth £10,800. After discussing the report, the Gas Committee recommended the Council to proceed with the negotiations; and a provisional agreement was entered into with the Gas Company on Oct. 11, 1899, and sealed by the Council. Steps were then taken to obtain a Provisional Order for the transfer of the works; and at a meeting of shareholders held on Dec. 22, 1899, a resolution was unanimously passed assenting to the provisional agreement. Owing to the development of the town, it would be necessary for the gas-works to be enlarged before next winter. The value of the existing works was put at £10,800, compensation at £400, produce and coal at £300, the probable cost of the Order at £250, and extensions to the works at £2000. The last item would be divided into £350 for enlargement of the retort-house; for new retorts, £500; for additional purifiers, £350; for 1200 yards of mains, £300; and £500 to carry on the undertaking. Mr. F. Barlow said the present gasholders had capacities of 10,000 and 27,000 cubic feet respectively; while there were between two and three miles of mains in the streets. He pointed out that the growth of Rothwell had taken place mainly during the past six years; but he did not think there was any chance of electrical competition. Mr. Evan Barlow said that at a meeting of the shareholders it was unanimously decided not to raise any opposition to the proposal. The inquiry closed with a vote of thanks to the Inspector.

SOUTH SHIELDS GAS COMPANY.

The Annual General Meeting of this Company was held last Wednesday—Dr. J. F. Armstrong in the chair.

The notice convening the meeting having been read, the report and accounts for the past year, the principal items in which were given in the "Journal" last week (p. 555), were presented.

The Chairman, in moving the adoption of the report, said the past year had been a very anxious one for the Directors. The two chief items affecting the Company's profits were coal and labour. Coal cost £5393, or 24¼ per cent., more than in the previous year; and wages came to £1356, or over 7½ per cent., more. These two items amounted to the large sum of £6749, or equal to 3·88 per cent.—or they might say 4 per cent.—of dividend. The most important item was coal; and had the price of this material come down, it would have made a great deal of difference. The reserve fund amounted to £3973; and the insurance fund to £3156—the two together making £7129. After deducting £1377 which they had to take to make up the half-yearly dividend, they would still have £2596 left in the reserve, or £5752 in the two funds. Their available balance was £6440, as compared with £6098 this time last year; so that they were £342 better under this head than in 1898, notwithstanding the large increase in coal and labour. The sale of gas had exceeded that of the year 1898 by 15,547,015 cubic feet, or 3½ per cent. There had been an improvement in the sale of residual products to the extent of £2250, or 20½ per cent.; and the net increase in the meter-rentals was £4725.

Alderman W. R. Smith seconded the motion.

Mr. W. Duncan expressed regret that the Company had been compelled to draw £1300 from the reserve fund in order to maintain their statutory dividend of 8¾ per cent. for the year. He was prepared to admit, however, that circumstances had been much against them. He thought the Directors had made a mistake in raising the price of gas by 2d. per 1000 cubic feet. If they looked at the Gas Companies in the North of England, they would find that not one of them had been content with a rise of 2d.; and therefore they in South Shields had made a present to the consumers of 1d. per 1000 feet. He was inclined, however, to believe that the people would not have objected if they had raised it by 3d. He was sorry to part with the 10 per cent. dividend, because it was a charming rate; but they had had 9¼ per cent., and he hoped that this time next year they would get back to it.

Alderman Bowman said he, too, was sorry the Directors had had to draw upon the reserve fund to pay the dividend; but it evidently could not be avoided.

The Chairman said the rise in price of coal and labour was equal to a 4 per cent. dividend. The price of coal just now was causing the Directors in South Shields, Sunderland, and other places, to give the matter very serious consideration. Coals were 50 per cent. dearer this year than they were last.

The report was adopted.

Votes of thanks having been accorded to the Directors and to the Chairman for presiding,

Alderman Bowman inquired whether the Directors had considered the penny-in-the-slot business, which he thought was well worth attention. It was evident, from the report of the Tynemouth Gas Company, that it had succeeded in that town and district; and he did not see why it should not do so in South Shields, Jarrow, and Hebburn.

The Chairman said the matter had been under the Directors' consideration; but it would entail a large expenditure before they started the meters, and they were now building a retort-house.

The retiring Directors and Auditors were then re-elected, and the proceedings closed.

NORTH MIDDLESEX GAS COMPANY.

The accounts of the above-named Company for the half year ending the 31st of December last, which were presented at the ordinary general meeting of shareholders yesterday, exhibited a considerable improvement in the business of the undertaking. The sale of 40,960,200 cubic feet of gas for private, and 3,029,000 cubic feet for public lighting, produced a revenue of £8797—being £1117 more than in the second half of 1898; the extra bulk of gas sold having been 5,587,200 cubic feet, or 14·5 per cent. The total receipts were £10,643; and the expenditure was £7158—leaving a balance of £3485 to go to the profit and loss account. The amount available for distribution was £3828; and the Directors recommended that dividends for the past half year be declared as follows: On the original capital at the rate of 10 per cent. per annum, and on the ordinary capital at the rate of 7 per cent. per annum. The payment of these would absorb £2153; leaving £1675 to be carried forward.

PROVINCIAL GAS AND WATER COMPANIES.

Gas Companies.

At the annual general meeting of the Abingdon Gas Company next Tuesday, the accounts presented will show that the revenue from the sale of gas last year amounted to £3978, and that the total receipts were £5616. As the expenses were £3697, there was a balance of £1919. The amount available for distribution is £1370; and the Directors will recommend that £500 of this sum should be placed to the credit of the capital account, and a dividend declared of 10s. per share on the original and "A" shares, and of 7s. per share on the "B" shares. This will absorb, after deducting income-tax, £684, and leave £186 to be carried forward. The bulk of gas sold for private consumption was 14,321,900 cubic feet; the entire quantity sold being 17,445,600 cubic feet—an increase of 2,599,100 cubic feet, or 14·87 per cent., on the previous twelve months' sale, which was a record one. Early last year, the Directors had a most successful exhibition of gas stoves and fittings in the Corn Exchange, Abingdon. This, no doubt, accounts for a considerable portion of the increased sales; 55 cookers and stoves having been sold or hired during, or shortly after, the exhibition. The experiment of fitting up the houses of small consumers free of charge, and allowing a special discount to those customers who use gas for other than illuminating purposes, has more than justified the policy followed by the Board in this direction. During the past year, the whole of the Company's mains were thoroughly examined and repaired where necessary, with the result that the waste from leakage has been brought down from 16·70 to 7·58 per cent.; and it is hoped that even this percentage will be still further reduced during the current year. Appended to the accounts is the certificate of the Manager (Mr. S. Crossland) that the buildings, machinery, and plant have been maintained in good working order, and that the stocks of coal, residuals, stores, &c., are of the values stated.

At the annual general meeting of the Armagh Gas Company on the 19th inst., the Directors will report that, notwithstanding the continued advance in the price of coal, the usual dividend has been earned. The revenue from the sale of gas last year was £3723, the prepayment meter supplies and the rental of gas-stoves bringing this amount up to £3810; residual products brought in £1478; and the total receipts were £5558. The expenditure on the manufacture of gas amounted to £3491 (coal costing £2706); and the total expenses were £4161—leaving £1397 to go to the profit and loss account. The net balance for the year amounts to £1111, which is £31 more than the sum required to pay the dividend. The Directors say that an extra valuation was put upon the Company last year under the head of "Right to lay main and service pipes in streets," the assessment on which for the past half year amounted to £20 12s. 6d. This claim the Directors decided to dispute; but on being sued in the County Court, they find that it must be paid. This will have the effect of leaving practically no balance to carry forward. They intend to appeal to the Valuation Commissioners for a re-valuation. In the meantime, they recommend the payment of the usual dividend of 2s. per share, free of income-tax. The Engineer and Manager (Mr. J. Whimster) reports that there was no exceptional expenditure on repairs, either within or outside the works, last year; but for the current twelve months the outlay on repairs to the manufacturing plant may, he says, be expected to be rather heavier than usual.

At the recent half-yearly meeting of the Bedford Gas Company, an increased balance from revenue of £450 was reported; this being mainly due to the larger quantity of residual products disposed of. Owing to advance contracts, the Company were unaffected by the rise in the price of coal. The draft of the Bill to raise £40,000 of additional capital for extensions to meet the demands of increasing population was approved.

The half-yearly meeting of the Brighton and Hove General Gas Company will be held next Friday, when the accounts presented will show that there was an increase in the revenue from the sale of both gas and residuals in the six months ending Dec. 31 last as compared with the latter half of 1898—the quantity of gas sold having been 7¾ per cent. greater. The charges for coal and wages, however, augmented in a larger ratio than the revenue; and in their report, the Directors express the opinion that the enhanced value of coal and materials will be felt still further during the current year. The revenue from the sale of 534,933,600 cubic feet of gas for public and private lighting was £74,823; the rental of meters, fittings, and stoves, £5198; residuals produced £20,073; and the total receipts were £100,367. The expenditure on the manufacture of gas amounted to £55,924 (coals, coke, and oil costing £38,718); on distribution, to £8826; and on management, to £4274—the total expenses being £73,138. The balance carried to the profit and loss account was £27,229; and the amount available for distribution, £30,888. The Directors recommend the declaration of dividends for the past half year at the rate of 11½ per cent. per annum on the original ordinary consolidated stock, 8½ per cent. per annum on the "A" ordinary consolidated stock, and 6 per cent. per annum on the "B" preference consolidated stock. For the payment of these dividends, £23,769 will be required; leaving a balance of £7119 to be carried forward. Under the supervision of Mr. Joseph Cash, the Company's Engineer, 42,759 tons of coal, 185 tons of cannel, and 358,427 gallons of enriching oils were employed in the manufacture of gas; the estimated quantities of residuals being: Coke, 26,521 tons; breeze, 2111 tons; tar, 533,743 gallons; and ammoniacal liquor, 922,514 gallons.

The annual meeting of the Canterbury Gas and Water Company was held yesterday week, when the Directors reported that the sale of gas continued to increase, and the income therefrom, as well as from residual products, was satisfactory. Notwithstanding another year's drought, there had been, and still was, an undiminished supply of water at the works. The increased demand for water, however, rendered it desirable to add to the plant at the pumping-station; and the subject was receiving attention. After defraying the interest on the loan capital and the transfer to the dividend account of the sums authorized by the Company's Act of 1890, there remained a credit balance of £4671 to carry forward to the profit and loss account. After payment of the interim dividend, there was a sum of £5175 standing to the credit of the dividend account; and the Directors recommended that a dividend of 4¾ per cent. should be declared—making, with the interim payment, 9 per cent. for the year. Reference was made to the approaching retirement of the Engineer and Manager, Mr. T. May (as noticed elsewhere) and to the loss sustained by the death of the late Vice-Chairman, Mr. F. Flint.

At the recent annual general meeting of the Chelmsford Gas Company—Mr. W. W. Duffield in the chair—the report presented showed a balance available for distribution of £2747, against £2869 in 1898. The Directors recommended the payment of dividends of 9 per cent. on the original capital, and £6 6s. per cent. on the additional capital. This would leave a balance of £107 16s. to be carried forward. The Chairman, in moving the adoption of the report, drew attention to the fact that, notwithstanding the reduction in the price of gas, the net amount earned by the Company was in excess of that of the previous year. They had also been able to carry a further sum to the reserve fund, and to wipe out £425, which was really the cost of obtaining an Act of Parliament some years ago, and which was charged to a particular account. They were a little alarmed at one time by the competition from the Electric Lighting Company; but they found that gas was required for purposes for which it was not used some time ago. In 1898 there were 164 penny-in-the-slot meters in the borough; whereas last year there were 223. In 1898 there were 68 gas-stoves in use; while last year there were 168. The report was adopted. The working statements in the accounts accompanying the report showed that, under the supervision of Mr. Er W. Smith, the Company's Engineer and Manager, 3713 tons of coal and 5 tons of cannel were carbonized last year. The make of gas was 39,330,100 cubic feet, of which 36,721,900 cubic feet were sold or used on the works; leaving 2,608,200 cubic feet unaccounted for, or 6·63 per cent. of the make. The present rate of increase in the output of gas is about 20 per cent. as compared with last year. With regard to residuals, the quantity of coke produced was 2417 tons, of which 1713 tons were sold, or at the rate of 9·20 cwt. per ton of coal carbonized. There were 38,345 gallons of tar; and the treatment of ammoniacal liquor yielded 20 tons of sulphate.

The shareholders of the Cork Gas Consumers' Company held their 62nd ordinary general meeting last Tuesday, when the Directors reported a small decrease in the rental for the six months ending Dec. 31 last, as compared with the corresponding period of the previous year. It amounted to £21,468; the residuals produced £7356; and the total revenue was £28,832. The expenditure was £22,033 (coals costing £11,376); so that a sum of £6799 was carried to the profit and loss account, the balance on which was £5146. As the usual dividend amounted to £5652, it was necessary to take £506 from the reserve fund to pay it. The price of gas supplied outside the public lighting district has been reduced to the rate charged in the city. There was a considerable improvement in the receipts for residuals in the past half year; and all the products realized higher prices. This compensated for the greater cost of coal. The Company's Resident Engineer (Mr. T. P. Travers) reported that the plant and buildings had been maintained in good working order. There was a large increase in the production of sulphate of ammonia as the result of the erection of new washers; and the manufacturing plant will shortly be extended by the completion of ovens in course of construction in the new retort-house.

Last Wednesday, the annual meeting of the Cradley Heath Gas Company was held, under the presidency of Sir Benjamin Hingley. The statement of accounts showed that the quantity of gas sold last year was 7 per cent. more than in 1898; and that a profit of £3236 had been made. The Chairman moved the adoption of the report, and congratulated the shareholders upon the continued prosperity of the Company. Dividends of 10, 7, and 4 per cent. were declared on the different classes of capital.

At the recent half-yearly meeting of the Douglas Gas Company, it was reported that the profits for the past six months amounted to £4638—an increase of £500 over the corresponding half of 1898. Adding the balance brought forward, made an available sum of £7088; and from this a dividend of 35s. per share has been declared. Though there is a credit balance of £4672 lodged in Dumbell's Bank—as to which there is doubt regarding the amount that will be realized—the Directors consider the position of the Company justifies the usual dividend. Regretful references were made to the recent disaster at the works; and it was mentioned that the Directors had made ample provision for the widows and orphans.

The half-yearly meeting of the Dover Gas Company was held yesterday, when the Directors reported an increase at the rate of 14·25 per cent. in the sales of gas for the six months ending Dec. 31, as compared with the corresponding period of 1898. This was mainly owing to the general expansion of the town and the adoption of prepayment meters, of which the Company now have 1192 in use. The coal supply necessarily caused the Directors great anxiety. They made very favourable contracts for the year; but, owing to an accident at the colliery and labour troubles, they were compelled to buy outside their contracts at current prices, in consequence of which the cost of coals was somewhat increased. The due supply of gas was, however, maintained. The accounts presented showed that the sale of 110,666,300 cubic feet of gas for public and private lighting produced a net revenue of £14,064; the rental of meters and stoves, £1291; and the sale of residual products, £4732—making a total of £20,087. The expenditure on the manufacture of gas was £12,981 (coals and oil costing £8453, and the town dues amounting to £836); on distribution, £2253; and on management, £963—the total expenses being £17,320. The amount carried to the profit and loss account was therefore £2767; and the balance on that account available for distribution was £5750. The Directors recommended the declaration of the usual dividend at the rate of 7½ per cent. per annum (less income-tax), amounting to £2870, and leaving a balance of £2880.

The half-yearly general meeting of the Eastbourne Gas Company was held on Monday last week—Dr. G. A. Jeffery in the chair. The report presented showed that the profit for the six months ending Dec. 31 was £7139, which, added to the balance of £10,888 brought forward, made a total of £18,027 standing to the credit of the profit and loss account. The Directors therefore recommended that dividends for the past half year be declared at the rate of 14½ per cent. per annum on the original capital and on the £12,490 raised on the "C" shares; and at the rate of 11½ per cent. per annum on the £77,000 raised on the "B" shares. These payments would absorb £6323, and leave a balance of £11,704 to be carried forward. In moving the adoption of the report, the Chairman said the profit for the past half year was £7139, as compared with £6328 in the corresponding half of 1898. Coals had cost £1573 more; and manufacture and repairs an excess of £1174. On the other hand, the residuals had produced an increased sum of £1576, and gas-rentals £2058 more. Greater profits on the sale of coke had to a large extent counteracted the effect of the enhanced price of coal. They had also received help from the sale of sulphate of ammonia and other products; but if coals continued to go up, they would, he was afraid, be unable to neutralize the rise by any extra profits from residuals. The sale of gas in the half year had been 142,557,000 cubic feet, against 127,630,000 cubic feet in the corresponding period, which represented a substantial advance. The coals used were 15,239 tons; and the gas made was 154,531,000 cubic feet, which was rather less than in the corresponding half of last year, owing chiefly to the poor quality of the coals, although the latter had been bought at an increased price. The leakage had been only 4 per cent. for the year, which was quite satisfactory. He was pleased to say that the whole of the works were in good condition. This, however, was the bright side of the picture. They had had great difficulties, and things had gone none too smoothly and regularly for the management. They had been greatly put to it of late to get the requisite quantity of coal, and both the Directors and the Manager had felt considerably harassed by the failure of the contractors to keep them fully supplied. However, they had pulled through all right; and he thought they might look forward to the future with every confidence and satisfaction. Alderman Farncombe seconded the motion; and it was carried unanimously. A vote of thanks having been accorded to the Chairman and Directors, it was briefly acknowledged by Dr. Jeffery, who proposed a similar compliment to the Consulting Engineer (Mr. H. E. Jones) and the Manager (Mr. J. Hammond), whose services he warmly eulogized. The proposition having been unanimously agreed to, Mr. Jones, in responding, said he could bear out the Chairman's remark that the last few months had been a most harassing time, especially for the Manager. Those responsible for their coal supply had, he thought, given them unnecessary trouble, though it was only fair to add that other gas companies all over the kingdom had been treated similarly; even the two great London Companies having been driven to within a few days' supply. The fact was that all the surplus stock had been required in the making of coke for the manufacture of steel, which, as the price had gone up 100 per cent., could easily pay a largely increased rate for coal, and so starve the gas companies. These had, however, a prior claim, owing to the contracts having been long made; and managers ought not to have been caused all the nervous anxiety they had had to endure. They were not wholly out of the wood yet; and considering the satisfactory way in which Mr. Hammond had overcome the difficulties that had stood in his way, he was certainly entitled to the shareholders' thanks. In the course of some general remarks, Mr. Jones alluded appreciably to the liberal and enlightened policy of the Directors, and expressed an opinion that ere long the price of gas in Eastbourne would be lower than it was in any other town in the South of England. The proceedings then terminated.

The report presented at the recent annual meeting of the East Grinstead Gas and Water Company showed that the receipts from the sale of gas, &c., in 1899 were £4047, as compared with £3634 in 1898; from residuals, £933, against £725; and from water, £1707, against £1664. The Directors thought the increase in the revenue from gas might be considered satisfactory, especially as the present price of 4s. compared with the higher price of 4s. 4d. for the early part of 1898. The accounts showed an available balance of £2364, from which the Directors recommended a dividend of 8 per cent. per annum on the "A" shares, and of £5 12s. per cent. on the "B" and "C" shares, free of income-tax. This would absorb £1746. In moving the adoption of the report, the Chairman (Mr. Stenning) said he thought the progress with the gas was gratifying, as it showed an increase in money of 11 per cent. The price of coal, and the difficulty in obtaining it, had been the causes of much anxiety, and he hoped they would not have to raise the price of gas. The water showed a very poor result—an increase of only 2½ per cent.—and they were carrying on the service almost, as it were, as a charity. Nothing had proved of such benefit to the district as the water, and yet the return was so small. The report was adopted. Votes of thanks were accorded the Directors, the Auditors, the Clerk (Mr. Evelyn Head), the Gas Manager (Mr. D. T. Livesey), and the Water Manager (Mr. R. G. Payne).

The annual meeting of the Elland-cum-Greetland Gas Company was held on the 23rd ult.—the Rev. G. E. Aspinall presiding. In moving the adoption of the report and accounts (noticed in the "JOURNAL" for the 13th ult.), and that a dividend be declared of 14s. per share on the ordinary shares for the half year, making, with the interim dividend paid six months ago, 13 per cent. per annum (1 per cent. more than last year), the Chairman dealt at some length with the position of the Company's affairs. He said the total increase in the consumption had been 7,696,000 cubic feet, equal to 8·85 per cent.; the additional consumption through prepayment meters being 42·85 per cent. The ordinary consumers had increased by 101; and the prepayment consumers by 180. They had now a total of 690 prepayment meters in use. During the year there had been 130 cookers and 44 washing-boilers let out on hire. There had been a satisfactory rise in the income derived from residual products to the extent of £742. The motion was carried.

The half-yearly meeting of the Harrogate Gas Company was held last Wednesday—Mr. S. Hornby, the Chairman, presiding. In the course of his remarks in moving the adoption of the report, he referred to the satisfactory result of the past year's work. Although it had, he said, been a year of anxious care for the Directors and officials, it had been a "record" one in several respects; the make of gas being 222,734,000 cubic feet, against 202,365,200 cubic feet in 1898. The maximum daily output 1,006,000 was cubic feet; while that of 1898 was 922,000 cubic feet. The receipts, expenditure, and profits were the heaviest in the history of the Company. He characterized the development of the Company's business as phenomenal, and submitted an interesting table of comparison between the years 1890 and 1899. Turning to the accounts, he lucidly dealt with every item; congratulating the proprietors upon an additional consumption of 15,183,000 cubic feet—an increase which he believed was equal to about 75 per cent. of the total units of electricity sold by their competitors. Owing to the improved condition of the coke, tar, and sulphate markets, residuals figured favourably. He was sorry the expenditure had been so heavy that the profits for the year were not so large as the Directors hoped they would be. They were, notwithstanding, £772 in excess of those for 1898; and this placed the net revenue in the satisfactory position of meeting all preferential charges and the usual dividends, and added £351 to the balance carried forward to the year 1900. Leaving the accounts, the Chairman proceeded to refer to the outlook. He said that, though the resources of the Company were taxed to meet the present demand, there

were difficulties to be encountered, such as the large increase in the price of coal, which would so seriously affect the revenue that he feared an advance in the price of gas would be necessary. He, however, assured the proprietors that such a step would not be taken except as the result of deliberate consideration by the Board. He alluded to the election of a Director in the place of Mr. P. H. Wilkinson, and expressed his regret that Mr. Wilkinson's continued infirmity rendered an appointment necessary. The adoption of the report and accounts, the declaration of the dividends, and the election of Directors and Auditors having been proposed, seconded, and carried, a vote of thanks to the Directors and officials closed the ordinary meeting. Immediately thereafter, an extraordinary meeting of the shareholders was held, at which the Directors were authorized to raise additional capital by the issue of a sum of £20,000 of new stock.

At the recent meeting of the Hertford Gas Company, the Directors reported that the profit on the revenue account for the year ending Dec. 31 last, after charging the balance of the suspense account (£433) for the renewal of the retort-house and coal-store, amounted to £1749. The sum standing to the credit of the profit and loss account, and available for distribution, was £1770, out of which the Directors recommended that, after paying the dividend of 5½ per cent., less income-tax, on the new preference shares, dividends for the year should be paid at the rate of 8½ per cent. per annum on the original shares and 7½ per cent. on the new shares, both less income-tax. Owing to the increasing output of gas, additions have been required to the plant, as well as extensions of the mains. The Chairman (Mr. J. R. Cocks), in moving the adoption of the report, stated that there was a gross profit of £2182 on the revenue account, against £1867 last year. The dividends recommended would absorb £1483 out of the £1770 at the shareholders' disposal; leaving a balance of £287 to be carried forward, as against £125 last year. Altogether, therefore, they started much more favourably than they did in the previous year. The increased output of gas was 3½ million cubic feet, or at the rate of 13½ per cent. This was due to the increased number of consumers; and, moreover, the reduction in price had stimulated consumption. After carefully studying their position, the Directors had decided to reduce the charge from 3s. 11d. to 3s. 9d. per 1000 cubic feet as from the 1st prox. The motion was carried unanimously; and the dividends recommended were declared. A vote of thanks was accorded to the Manager (Mr. R. Watson), who, in acknowledging the compliment, stated that during the past four years there had been an increase of 25 per cent. in the consumption of gas. It seemed rather risky, he added, to reduce the price in the face of the increase in the cost of coal; but, under all the circumstances, he thought the Directors were justified in the course they had taken. At the close of the business of the ordinary meeting, the Directors were authorized to raise a sum not exceeding £3000 on mortgage, at the maximum rate of 4 per cent.

The 72nd half-yearly meeting of the Leominster Gas and Coke Company, Limited, was held last Saturday, when the accounts presented showed that the sale of 18,274,100 cubic feet of gas for private consumption produced £3045, and that used for public lighting £310—together, £3355. The total revenue was £4384; and the expenditure, £3412. The balance carried to the profit and loss account was £972; and the amount available for distribution was £403. The Directors recommended the payment of dividends at the usual maximum rates on both classes of shares. In their report, they recorded an increase of 1,042,000 cubic feet, or at the rate of upwards of 6 per cent., in the sale of gas, largely owing to the introduction of prepayment meters and to an exhibition of cooking-stoves held in the summer. The Company's Manager (Mr. C. Eastment) requires additional retorts and a new station-meter; and for these and other works further capital is to be raised.

The annual meeting of the Matlock and District Gas Company, Limited, was held on Monday last week. The profits for the past year amounted to £2772, and the addition of £792 brought forward made a sum of £3564 available for distribution. Dividends of 10 per cent. on the original capital and 7 per cent. on the new shares were declared.

At the recent half-yearly meeting of the Normanton Gas Company, the report presented showed that the profits in the six months ending Dec. 31 amounted to £1203; making the fund available for dividend (after providing interest on mortgages) £3161. Out of this, dividends of 5½ per cent. on the original, and 4 per cent. on the additional stock were recommended; leaving £1981 to be carried forward. The Chairman (Mr. E. Mitchell, J.P.) moved the adoption of the report. He said, notwithstanding the advance in the price of coal, they had been able to maintain the dividend. The sale of gas through ordinary meters produced £2588, an increase of £220; and that through prepayment meters, £439, an increase of £21. The sale of coke had increased by £221, and tar £47. One unfavourable feature was the increased leakage, which was 20·28 per cent., against 18 per cent. last half year. The report was adopted, and the dividends recommended were declared.

At the half-yearly meeting of the Pontefract Gas Company held a few days ago under the presidency of Mr. J. Taylor, the Chairman, the report, which was adopted, showed that the amount divisible among the shareholders was £1508, out of which the Directors recommended the payment of the usual maximum dividends of 10 per cent. on the original shares, and 7 per cent. on the new ordinary shares. The reserve fund now amounts to £2676.

The annual meeting of the Rowley Regis and Blackheath Gas Company was held last Wednesday—Mr. W. North presiding. The report showed that the receipts for the year were, on the whole, satisfactory. The gas-rental had increased by £65, and the prepayment meter rental by £52. The balance on the profit and loss account being £1319, the Directors recommended the payment of a dividend of 7½ per cent. (free of income-tax), amounting to £712 10s.; the placing to the reserve fund of £100, and to renewals fund of £100; and the carrying forward of the balance. The report was adopted.

The annual meeting of the Tunbridge Wells Gas Company was held last Wednesday, under the presidency of Alderman W. H. Delves. In moving the adoption of the report, the Chairman congratulated the shareholders upon the satisfactory progress made during the year. The capital account, which was overdrawn to the extent of £4269, remained practically the same as last year, except that they had spent a net amount of £1368 in laying new mains, making extensions, &c. The revenue account showed that £2944 more had been expended for coals than in former years. The total increase in expenditure for the manufacture of gas was £3470. The distribution of gas and all other items came to exactly the same amount as in 1898. On the other hand, the gas-rentals had risen from £30,081 to £31,890—an increase of £1809. The rental of meters also showed a satisfactory improvement, as did also the automatic meters, from £2053 to £2126 in the year; and the gas consumed was about equal to 22 million feet. The rise in residuals was £1954. So that, after paying dividends, interest charges, debentures, and temporary loans, the balance would be augmented by £2200. This was very satisfactory, considering the great difference in the price of coal. The extra sale of gas amounted to rather more than 7½ per cent. Dividends were declared of 11½ per cent. on the consolidated ordinary shares, 9 per cent. on the "B" shares, and 8½ per cent on the "C" and "D" shares.

At the annual general meeting of the Tynemouth Gas Company on Thursday next, the accounts to be presented will show that the revenue from the sale of gas amounted last year to £29,396—the rental of meters, stoves, and Bray's lamps (£1679) bringing up this amount to £31,075; the sale of residuals produced £10,421; and the total receipts were £41,757. The expenditure on the manufacture of gas came to £23,040 (coals and enrichment costing £12,324); on distribution, to £4975; and on management, to £2060—the total expenses being £32,468. The balance on the year's working was therefore £9289. Adding the balance of undivided profit, £978, a total of £10,267 is produced. Of this the interim dividend to the 30th of June, at the rate of 5 per cent. per annum, absorbed £3111 13s., and a dividend at a like rate for the second half of the year will leave a balance of £4044 to be carried forward, in addition to the reserve fund of £7500 brought from 1898. In the report, the Directors express their pleasure in recording an increase of 19,572,100 cubic feet, or 6·14 per cent., in the make of gas, and a larger sale to the extent of 22,995,000 cubic feet, or 8·9 per cent., as compared with the preceding year. The number of ordinary meters in use on Dec. 31 last, was 5500; being an increase of 200, or 3·77 per cent., for the year. The number of automatic prepayment meters in operation at that date was 890; being 511, or 134·82 per cent., more than on the corresponding date in 1898. The number of gas cooking-stoves was 791—an increase of 131, or 19·85 per cent. In common with their colleagues in other parts of the country, the Directors regard with apprehension the serious rise in the price of coal and all other gas-manufacturing materials; but they state that the market for residuals showed a distinct improvement last year. The Company's Engineer (Mr. W. Hardie) reports that the works and plant are efficient, and maintained in excellent order. Under his supervision, 29,608 tons 13 cwt. of coal and 20 tons 17 cwt. of cannel were used last year in the production of 305,596,000 cubic feet of gas, of which 281,106,000 cubic feet were sold and 285,046,000 cubic feet accounted for. The estimated quantities of residuals were: Coke, 17,783 tons; tar, 299,175 gallons; while from the ammoniacal liquor produced, 245 tons of sulphate of ammonia were manufactured.

The 39th annual meeting of the Uxbridge and Hillingdon Gas Consumers' Company was held on the 20th ult.—Mr. W. Fassnidge in the chair. In moving the adoption of the report and accounts, he said that, as compared with the year ending Dec. 31, 1898, the receipts for gas sold, for meter and stove rentals, and for residual products, &c., were more by £1343. The quantity of gas brought into charge in 1898 was 42,649,200 cubic feet, while for 1899 it was 46,233,400 cubic feet; showing an increase in the consumption of a little over 3½ millions—actually 3,584,200 cubic feet. The account for residuals was more favourable than in the previous year. The gross expenditure for 1899 was more than for 1898 by £1327, accounted for by the increase in the quantity of gas sold, the enlargement and renewal of services, and other improvements. The profit and loss account showed that, after paying debenture interest, &c., there remained £2677, which, with the surplus from the previous year, made £2841 at the disposal of the shareholders, which was sufficient to pay the statutory dividends, amounting to £2651, and leave a balance of £190 to carry forward. This statement was looked upon by the Directors as favourable; and he trusted it would be received in the same manner by the shareholders. At the previous meeting, he mentioned an increase in gas consumption for the year 1898 over the year 1897 of nearly 7 million cubic feet. He was now pleased to state that there was a further increase in the year 1899 of upwards of 3½ millions over 1898. Their Engineer and Manager (Mr. A. R. Burch), when they last met, was somewhat new to them. They had now seen more of him, and were of opinion that he had the interest of the Company at heart; and the extra consumption of gas in the year was to a great extent due to his energy and desire to please all their customers. The motion was carried unanimously; and dividends of 10, 7½, and 7 per cent. were declared.

The half-yearly general meeting of the Wellingborough Gas Company was held on Monday last week, when the Directors had the gratification of submitting accounts for the six months ending Dec. 31 which showed a continued increase of business; the quantity of gas sold being more than 11½ per cent. greater than in the corresponding period of 1898. The total revenue from this source amounted to £6853; the sale of residuals produced £1823; and the total receipts were £9486. The expenditure on the manufacture of gas came to £5833 (coals costing £3501); and the total expenses amounted to £7269. The balance carried to the profit and loss account was £2217; and the sum available for distribution was £3895. The Directors recommended the declaration of dividends of 6 per cent. on the "A" and "B" shares, and 4½ per cent. on the "C" shares (free of income-tax), for the half year. They reported that, under Mr. John T. Lewis, the Engineer and Manager, the works were being maintained in a full state of efficiency; and that to meet the increased demand for gas, further alterations and extensions were in progress. The 110-feet gasholder is to be telescoped during the coming summer to provide additional storage capacity. The Directors added that, though there had been a considerable advance in the cost of coal, it had been practically covered by the increased price obtained for residuals, and had not affected the Company's profits. The report was adopted, and the dividends recommended were declared. The working statements in the accounts showed that 4715 tons of coal were carbonized, and 51,150,000 cubic feet of gas made, or at the rate of 10,848 feet per ton. Of this quantity, 49,152,000 cubic feet, or 10,424 feet per ton, were accounted for; 48,734,000 cubic feet, or 10,336 feet per ton, being sold. The unaccounted-for gas in the half year was 3·9 per cent. The quantity of coke for sale per ton of coal carbonized was 11 cwt. 0 qr. 15 lbs.

At the recent half-yearly meeting of the Winchester Water and Gas Company, the Directors reported that the receipts on revenue account for the six months ending Dec. 31 last amounted to £11,318, and the expenditure to £7134; leaving a balance to be carried to the profit and loss account of £4183, and making the balance on this account £6783. Dividends for the half year, at the rate of 10 per cent. per annum on the original shares, and of 7 per cent. per annum on the new shares, both less income-tax, were declared.

The half-yearly meeting of the Wolverhampton Gas Company was held last Tuesday—Mr. S. Loveridge presiding. The Directors recommended dividends for the half year of 3 per cent. on the preference stock, 5 per cent. on the consolidated stock, and 3 per cent. on the new ordinary stock, less income-tax. The Chairman, in moving the adoption of the report, congratulated the shareholders on the usual dividends having been earned. Higher prices had been obtained for residuals, and favourable contracts had been made for the supply of coal; and these contracts extended up to Midsummer. Large amounts were being spent to increase the size of the mains, and also to meet the wants of the suburban consumers. Owing to the capital of the Company being nearly exhausted, they were applying to Parliament for power to increase it and to meet other requirements, in order that they might put themselves in a position to supply an adequate volume of gas to all the consumers. The new works were practically completed, and a considerable amount was now being saved in working expenses. The report was adopted, and the dividends recommended were approved. A special meeting was held to consider the Bill above referred to, which is to authorize the construction of further works, the purchase of land, and the raising of additional capital to the amount of £140,000. The resolution sanctioning its promotion was approved.

Water Companies.

The receipts of the Dorking Water Company in the six months ending Dec. 31 last were £1657; and the expenditure was £758. With the balance brought forward, the sum available for distribution was £1621. At the recent half-yearly meeting, a dividend at the rate of 5 per cent. per annum was declared. This absorbed £1100, and left a balance of £521. The expenses for fuel and wages were higher than in the corresponding half of last year.

Steady and continuous prosperity was reported by the Directors of the Exmouth Water Company, at the recent half-yearly meeting, to be characteristic of the undertaking. Upwards of 2180 dwelling-houses are now supplied with water, and the half-year's accounts showed that a balance of £1165 was available for distribution. The usual dividends were declared.

At the annual meeting of the Faversham Water Company, a dividend of 9 per cent. was declared on the original, and 6½ per cent. on the additional capital. The report stated that there had been an increase of 76 services during the year; the receipts from the water-rates being £2198. It was agreed to issue £1300 of additional share capital, and also debentures to the amount of £4500, in order to complete a new reservoir and deep well.

The annual general meeting of the Felixstowe and Walton Water Company was held last Tuesday. The report showed that the balance standing to the credit of dividend and interest account amounted to £1563. The Directors recommended that a dividend of 5 per cent. be paid for the year on the original capital, and of £4 13s. 4d. per cent. on the additional capital. The Felixstowe and Walton Urban District Council had informed the Company that they did not intend to purchase the undertaking under the Act obtained by them for that purpose in 1898. In order to protect the interests of the Company, the Directors had proceeded to arbitration; and unless the Council purchased within six months of the date of the award, they would have no further opportunity of doing so. In order to meet the increasing requirements of the district, the Directors had decided to erect a new tower and service-tank, as well as cottages for workmen. The report and accounts were adopted.

The half-yearly meeting of the Leatherhead and District Water Company was held last Thursday. Mr. John Boustead presided in the absence, through illness, of the Chairman of the Company. The report stated that the receipts for the half year amounted to £2366, and the working expenses to £1300—leaving a profit of £1066. To this had to be added the sum of £857 brought forward, making a total of £1923. Deducting from this £158 interest on debenture stock, there remained £1765 available for distribution. Out of this, the Directors recommended a dividend at the rate of 5½ per cent. per annum, which would absorb £882, and leave a balance of £883 to be carried forward. During the half year 52 new services had been laid on, making a total for the year of 105. Appended to the Directors' report was the report of the Engineer (Mr. F. S. Cripps). In it he said that the water supply during the six months had been satisfactory, and the quality perfectly pure. A new 12-inch main had been laid across the river, which greatly facilitated the pumping to the reservoirs, and was a protection against any possible breakdown of the old 7-inch main. The Chairman, moving the adoption of the report, said that the Company continued to make very satisfactory progress. There had been a large increase in the supply of water during the past half year; and the receipts had also increased. The working expenses had been slightly more, owing to the drought of last summer. There had, however, been no failure in the supply; and had they been in the Metropolitan area, they would have been able to assist those of the London Water Companies who were not in so good a position as themselves. He would quote a few figures to show the progress made by the Company during the last four years. In 1895, the quantity of water pumped was 28 million gallons, whereas last year it was 57 millions. In the same period the water-rates had increased from £1432 to £2218; the profit showed an increase of £558; and the dividend, instead of being 2½ per cent., was now 5½ per cent. In reply to questions, the Chairman said, with regard to the hardness of the water, that it would be desirable to soften it, though he believed that hard spring water was better for many purposes than soft water. Their limits of charge were defined, so that even if they incurred an additional outlay in supplying their customers with what people called a better article, they would not be in a position to charge a higher price for it. The matter, however, was constantly kept in mind by the Board; and if at any time they saw their way to carry out a water-softening scheme without loss to the Company, it should be done. The report was adopted.

The 64th half-yearly meeting of the Luton Water Company was held last Wednesday—Mr. B. Seebohm presiding. The balance-sheet showed

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 597.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Oct. 13	10½	Alliance & Dublin 10 p. c.	20½—21½	..	4 17 8
100,000	10	,,	7½	Do. 7 p. c.	14—15	..	5 0 0
800,000	100	Jan. 2	5	Australian 5 p. c. Deb.	100—102	..	4 18 0
200,000	5	Nov. 15	6	Bombay, Ltd.	6—6½	+¼	4 12 4
40,000	5	,,	6	Do. New, £4 paid	4—4½	..	5 6 8
880,000	Stk.	Feb. 23	12	Brentford Consolidated	£67—£72*	..	4 8 3
270,000	,,	,,	9	Do. New	203—208*	..	4 6 7
50,000	,,	,,	5	Do. 5 p. c. Pref.	140—145*	..	3 9 0
159,375	,,	Dec. 14	4	Do. 4 p. c. Deb.	118—123	..	3 5 1
220,000	Stk.	Sept. 15	11½	Brighton & Hove Orig.	255—260	..	4 8 6
226,320	,,	,,	8½	Do. A. Ord. Stk.	185—190	..	4 9 6
973,500	Stk.	Aug. 16	5	Bristol, 5 p. c. max.	125—130	..	3 16 11
420,000	20	Sept. 29	10	British	43—44	..	4 10 11
50,000	10	Feb. 23	12	Bromley, Ord. 10 p. c.	24—26*	..	4 12 4
75,000	10	,,	9	Do. 7 p. c.	19—21*	..	4 5 8
500,000	10	Oct. 13	6	Buenos Ayres (New) Ltd.	9¾—10½	..	5 17 1
220,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	98—100	..	4 0 0
150,000	20	July 13	8½	Cagliari, Ltd.	26—28	−1	5 17 10
100,000	10	Sept. 29	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Oct. 13	13½	Commercial Old Stock	305—310	..	4 7 1
200,750	,,	,,	10½	Do. New do.	240—245	..	4 5 9
200,750	,,	Dec. 14	4½	Do. 4½ p.c. Deb.	140—145	..	3 2 1
600,000	Stk.	Dec. 14	9	Continental Union, Ltd.	177—181	..	4 19 5
200,000	,,	,,	7	Do. 7 p.c. Pref.	178—183	..	3 16 6
51,600	Stk.	Aug. 31	14	Croydon A 10 p.c.	335—340	..	4 2 4
168,400	,,	,,	11	Do. B 7 p.c.	265—270	..	4 1 5
555,000	Stk.	Feb. 23	5½	Crystal Palace Ord. 5 p.c.	122—127*	..	4 2 8
60,000	,,	,,	5	Do. 5 p.c. Pref.	132—137*	..	3 13 0
486,090	10	Jan. 26	11	European, Ltd.	20—21	−½	5 4 9
354,060	10	,,	11	Do. £7 10s. paid	15—16	..	5 3 2
14,993,075	Stk.	Feb. 9	4 p. c.	Gas-light & Coke	4 p. c. Ord.	..	4 13 5
2,600,000	,,	,,	3½		3½ p. c. max.	..	3 11 5
3,799,735	,,	,,	4		4 p. c. Con. Pref.	..	3 5 7
3,993,975	,,	Dec. 14	3		3 p. c. Con. Deb.	..	2 19 5
70,000	10	Nov. 15	8	Hongkong & China, Ltd.	13¼—14½	..	5 10 4
3,800,000	Stk.	Nov. 15	10	Imperial Continental	217—220	+1	4 10 11
473,600	Stk.	Feb. 9	3½	Do. 3½ p. c. Deb. Red.	100—103	..	3 8 0
75,000	5	Dec. 14	6	Malta & Medn., Ltd.	4½—5½	..	5 9 1
550,000	100	Oct. 2	5	Met. of	5 p. c. Deb.	..	4 7 9
250,000	100	,,	4½	Melbourne	4½ p. c. Deb.	..	4 2 7
541,920	20	Nov. 15	3	Monte Video, Ltd.	11—12	..	5 0 0
617,946	Stk.	Feb. 23	9½	Newc'tle & Gatesh'd Con.	215—220*	..	4 4 1
264,855	Stk.	Dec. 29	3½	Do. 3½ p. c. Deb.	104—107	..	3 5 5
60,000	5	Feb. 23	7	Ottoman, Ltd.	4¾—5¼*	..	6 13 4

* Ex div.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	Nov. 30	8	Oriental, Ltd.	7—7½	..	5 6 8
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—6¾	..	5 6 8
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1¾	..	4 11 5
500,000	100	Dec. 1	6	People's Gas 2nd Mtg. of Chicago Bonds	102—106	..	5 13 2
851,070	10	Oct. 13	7	River Plate Ord.	11—11½	..	6 1 9
250,000	Stk.	Dec. 29	4	Do. 4 p. c. Deb.	100—104	+1	3 18 5
250,000	10	Sept. 15	10	San Paulo, Ltd.	12—13	..	7 13 10
135,000	Stk.	Sept. 15	10	Sheffield A.	249—251	..	3 19 8
209,053	,,	,,	10	Do. B.	249—251	..	3 19 8
447,427	,,	,,	10	Do. C.	249—251	..	3 19 8
5,600,000	Stk.	Feb. 23	5½	South Metrop., 4 p. c. Cr'l.	133—133	+1	3 18 4
1,520,000	,,	Jan. 12	3	Do. 3 p. c. Deb.	100—102	..	2 18 10
120,000	Stk.	Aug. 31	6	Tottenham A. 5 p.c. and B. 3½ p.c.	141—143	..	4 3 11
250,520	,,	,,	4½		102—104	..	4 6 6
55,100	,,	Dec. 14	4	Edmonton 4 p. c. Deb.	113—117	..	3 8 5
182,380	10	Jan. 12	5	Tuscan, Ltd.	8½—9½	..	5 5 3
149,900	10	Jan. 2	5	Do. 5 p. c. Deb. Red.	101—104	..	4 16 2
				WATER COMPANIES.			
780,399	Stk.	Dec. 29	11	Chelsea, Ord.	£07—312	..	3 10 6
150,000	,,	,,	5	Do. 5 p. c. Pref.	157—162	..	3 1 9
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	145—150	..	3 0 0
175,785	,,	Sept. 29	4½	Do. 4½ p. c. Deb.	148—153	..	2 18 10
1,730,560	Stk.	Oct. 13	7	East London, Old.	205—210	+2	3 6 8
654,740	,,	Dec. 29	4½	Do. 4½ p. c. Deb.	145—150	..	3 0 0
890,000	,,	,,	3	Do. 3 p. c. Deb.	99—101	+1	2 19 5
700,000	50	Dec. 14	7½	Grand 10 p. c. max.	108—110	..	3 8 2
310,000	Stk.	Sept. 29	4	Junction 4 p. c. Deb.	131—136	..	2 18 10
708,000	Stk.	Feb. 23	14	Kent	330—340*	..	4 2 4
160,000	,,	,,	7	Do. New, 7 p. c. max.	200—210	..	3 6 8
1,043,800	100	Dec. 29	10½	Lambeth, 10 p. c. max.	295—300	..	3 10 0
406,200	100	,,	8	Do. 7½ p. c. max.	215—220	..	3 12 9
350,000	Stk.	Sept. 29	4	Do. 4 p. c. Deb.	135—138	..	2 18 0
500,000	100	Feb. 23	12½	New River, New Shares	420—425*	..	3 2 0
1,000,000	Stk.	Jan. 26	4	Do. 4 p. c. Deb.	132—137	..	2 18 5
902,300	Stk.	Dec. 14	7½	South-wark Ord.	201—205	..	3 13 2
126,500	100	,,	7½		190—195	..	3 16 11
489,200	Stk.	,,	5	and 5 p. c. Pref.	160—165	..	3 0 7
1,019,585	,,	Oct. 13	4	Vauxhall 4 p. c. A Deb.	131—136	..	2 18 10
1,155,066	Stk.	Dec. 14	16	West Middlesex	290—296	..	3 7 7
200,000	,,	,,	4½	Do. 4½ p. c. Deb.	147—152	..	2 19 3
200,000	,,	Sept. 15	8	Do. 8 p. c. Deb.	100—102	..	2 18 10

*Ex div.

a profit of £2739, out of which the Directors proposed to pay the maximum dividend of 4 per cent. and carry forward £438 to the renewal and contingency fund, which now stands at £5529. The receipts from water-rates and sales showed an increase of £270 as compared with the corresponding period of 1898; but the balance, after deducting maintenance and working expenses, was about £400 less, owing to the thorough overhaul and repair of one of the engines. In briefly commenting on the report, the Chairman said that the outlay for engine repairs was quite exceptional. It was owing to an accident, and was not likely to occur again; the engine being now made as good as new. The report was unanimously adopted.

It was announced at the half-yearly meeting of the Maidstone Water Company that the water-rents for the past six months amounted to £5917; being an increase of £336 over the corresponding period of 1898. The accounts showed a balance of £2176 at the credit of profit and loss account. Dividends at the rates of 5 and 3½ per cent. per annum on the two classes of shares would, it was stated, absorb £1120; leaving £1056 to be carried forward. The dividends for the previous half year were £4 6s. 8d. and £3 1s. 8d. respectively. The total receipts for the half year were £6133, and the expenditure £3786; leaving £2347 to be carried to the profit and loss account. At his own request, Alderman George Marsham has been relieved of the duties of the chairmanship; but the Company will continue to receive the benefit of his services on the Board. He took the head of affairs at the time the concern was in a critical position owing to the epidemic in the town; and since then he has ungrudgingly given to the work an immense amount of time and labour. Mr. H. W. T. Drake succeeds to the chair, and Mr. W. H. Bensted to the vice-chair.

The recent annual meeting of the South Hants Water Company, held at Southampton, was a very harmonious gathering; the most striking feature being the resolution to write off at once the £3089 of law and parliamentary charges in connection with the opposition to the Bill of the Southampton Corporation last year. The receipts amounted to £18,074, and £11,381 had been carried to profit and loss account. The dividends declared were 10 per cent. on the ordinary and 7 per cent. on the new ordinary shares. During the year, the new engine and boiler house at Twyford was completed, and a softening-tank and reservoir erected. An additional well is being sunk there, which will be a valuable auxiliary to the works. The net increase in the year's rental was £1338. At an extraordinary meeting, the proprietors authorized the raising of additional capital to the amount of £25,000.

The half-yearly general meeting of the West Surrey Water Company was held on the 27th ult.—Mr. A. T. Simpson presiding. The accounts for the half year ended the 31st of December last showed that the income, after making provision for empty houses, irrecoverable rates, &c., amounted to £5110, and the expenditure to £1849; being an increase of £629 of income and £132 of expenditure as compared with the latter half of 1898. There were 176 additional supplies connected to the Company's mains—representing a future rental of £329 19s. 8d. per annum; and 2460 yards of cast-iron pipes were laid in the parish of Shepperton. The Engineer and Manager (Mr. J. K. Hill) reported that the whole of the Company's works were in good order. After transferring from revenue £300 to the contingency fund, the amount available for distribution was £4031, which the Directors recommended should be applied as follows: In payment of dividends upon the preference shares (5 and 6 per cent.), amounting to £536 10s.; and of a dividend at the rate of 6½ per cent. per annum upon the ordinary shares, amounting to £1824—leaving a balance of £1670 to be carried forward. The report and accounts were approved and adopted, and the dividends recommended were declared. A vote of thanks to the Chairman, Directors, and officers of the Company concluded the meeting.

ELECTRIC LIGHTING NOTES.

Great consternation was caused at Spital Hill, Sheffield, last Tuesday, by the occurrence of a double explosion in an open street. The first report was heard about 40 minutes past twelve; and the second almost immediately afterwards. There had been an accumulation of gas in two of the underground boxes through which are carried the electric current cables of the tramway system, and the near proximity of burning coal caused an explosion in one box, which fired the gas in the other. The pavement plate over the second box was blown high into the air. The two boxes were about 30 yards apart. Fortunately no one was seriously injured.

With befitting ceremony, the electric lighting works which have been erected by the York Corporation, at a cost of £20,000, were inaugurated yesterday week. This is the realization of an idea which it has taken ten years to develop; but perhaps the City Council have been a bit uneasy as to its ultimate success, seeing that this is the first trading enterprise they have entered upon. The scheme is the work of Professor Kennedy; and the present installation is capable of supplying at one time 6600 lamps of 8-candle power each. The undertaking starts on its career with about 100 customers; and the Corporation require alone something like 3000 lights on their premises.

At the meeting of the Southampton County Council last Wednesday, the Electricity Committee reported that two serious failures of the light had occurred, both due to short-circuits on the mains in the old part of the system—the cause being explained; and it was stated that steps were being taken to minimize the possibility of the recurrence of such a breakdown. A letter was read from Messrs. G. J. Tilling and Sons, Limited, stating that when their men arrived at the Sail Works, Town Quay, recently, they were unable to obtain any electric light, and consequently were from six to eight o'clock without being able to do any work, and claiming the wages paid the men during this time—viz., 23 men, two hours each at 8d., £1 10s. 8d. The letter was referred to the Engineer (Mr. F. H. Chaplin) to report upon.

The "Electrician" remarks that the experience of the residents of St. Louis must be absolutely unique in the history of the electric lighting industry. That the streets and public places of a large city should be left in utter darkness, because of a difference as regards the price to be paid for these lights, is a circumstance which has probably not had a

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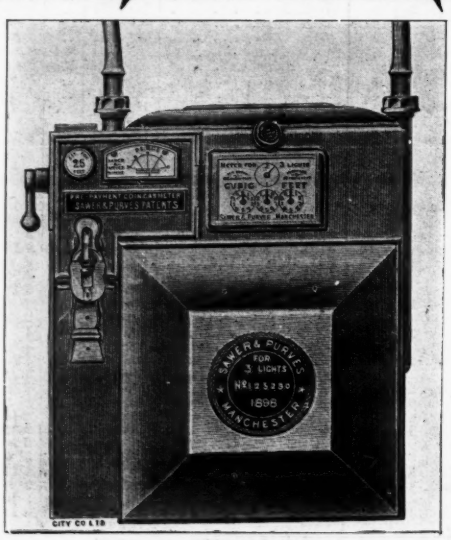
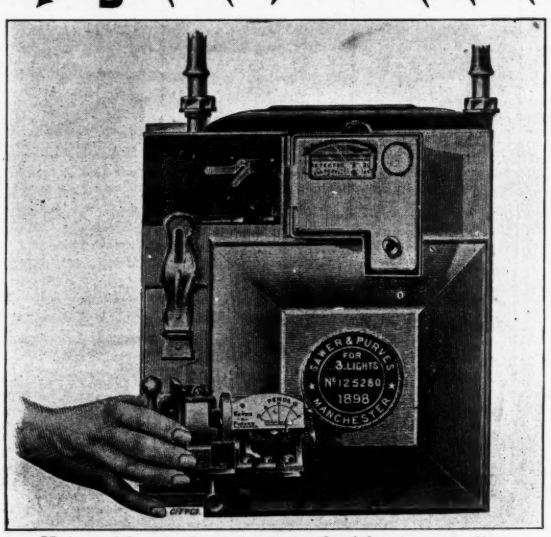


Meter in working position.



Meter with attachment removed without uncoupling.

parallel in cities of the same size. According to a Chicago paper, the St. Louis Board of Delegates desired, mainly because of the low state of the city's finances, that the price previously paid to the local Lighting Company should be considerably reduced. This reduction the Company refused to accept; and accordingly, as soon as the existing contracts had expired, they cut off all the public lights, leaving the official buildings and public institutions to fare as best they could.

The fifth annual statement of accounts of the electric light undertaking of the Bedford Corporation shows a decided improvement; but the ratepayers have to provide a deficit of £288. Out of £105,050 sanctioned, £64,000 has been borrowed and £7000 repaid. Last year the working expenses, &c., amounted to £4881, and the receipts were £8797; leaving a balance of £3916. However, interest and instalments of principal came to £4204, and left £288, as above mentioned, to be provided from the rates. In moving the adoption of the report, Alderman Richards, the Chairman of the Electric Light Committee, said he did so with great satisfaction and pardonable pride. They would have had a profit but for reducing the price of the current by 1½d., to 4½d. per unit. The Committee were fortunate in having made their coal contracts last summer; for during the dark days of winter they used 100 tons a week. They had reduced the cost of output, and worked with great economy. In 1898, the output was 360,000 units; but last year it rose to 550,000 units. They had now 600 consumers—an increase of 174. The total number of 8-candle lamps in use was 27,000; there were 530 public lamps charged for at 3d. per unit; cables were laid in 13 miles of streets for private consumers; and there were 200 miles of cables in all. Reference was made to the satisfactory working of electric motors in pumping sewage at the sewage works. The Chairman, Committee, and Town Clerk were thanked for their labours in connection with the development of the works.

At the invitation of the Directors, a large party, including Lord Kelvin and other distinguished electrical engineers, last Thursday inspected the new works of the Metropolitan Electric Supply Company, which are situated about a mile from Willesden Junction. The site upon which they stand is about 8½ acres in extent, and is well located with regard to facilities for the cheap and rapid delivery of the necessary coal supply. The works as they now exist cover only a small part of the area over which they will ultimately extend. When finished they will occupy more than 2½ acres, and will consist of two parallel boiler-houses, each 384 feet long by 88 feet wide, with a two-bay engine-house between, measuring 384 feet by 112 feet, and four large chimney-shafts. This engine-house will contain 18 1500-kilowatt alternators, arranged in two rows of nine each, and capable of providing for the requirements of a connection of 1,620,000 lamps, or of actually lighting about 810,000 8-candle lamps. At present only three of these alternators, with a proportional extent of the boiler-house, have been erected; but a second section of equal size is now under construction. The boiler-house as it now stands measures 164 feet by 88 feet, and contains 16 Babcock water-tube boilers, disposed in two rows, and having a heating surface of 3500 square feet each. The three engines now at work are of the Westinghouse vertical compound type, each of 2500 indicated horse power, and fitted with automatic expansion governors. Each is coupled direct to an alternator standing on the same foundation (a mass of concrete 19 feet thick), and is provided with its own circulating and air pumps and condenser. The revolving armature of the alternators, whose field magnets have 62 poles, is about 17 feet in diameter; and at a speed of 116 revolutions a minute each generates a two-phase alternating current of 3000 ampères at a potential of 500 volts. From the alternators the current is conveyed to the switchboard, placed in a gallery above the engine-room, and thence to the transformer-house, where its potential is raised to 10,000 volts to enable it to be economically transmitted to the various transformer sub-stations in London, where it is again reduced as required by the circumstances of the districts served. The transformers are 14 in number, each of 250-kilowatt capacity. From the transformer-house the current is conveyed to London by five concentric cables, so arranged that one acts as a reserve to the other four. These are laid in five-way cast-iron conduits, in which there is space to put five more mains when required; and they are insulated with paper and covered with lead.

LINCOLN CORPORATION WATER SUPPLY.

Proposed Boring at Boultham.

During the past ten years, the Corporation of Lincoln have from time to time had their attention directed to the water supply of the city. As far back as September, 1891, Mr. C. E. De Rance reported on the matter; and in the following January a Special Water Committee, appointed for the purpose, put the Corporation in possession of all the information on the subject then available. But they did not feel justified in advising an extension of the supply. In October, 1898, however, Professor Hull recommended that this should be done by means of a deep boring at Boultham. Several estimates and reports were obtained by the late Water Engineer (Mr. H. Teague) from various well sinkers; but no definite steps were taken in the matter till July last year, when the Corporation called in Mr. Percy Griffith, Assoc.M.Inst.C.E., F.G.S., of Westminster, to advise them as to the best detailed plan of "boring for water from the red sandstone on or near the site of the water-works at Boultham." Mr. Griffith was peculiarly fitted, from the experience he has gained in connection with the boring operations in progress at Gainsborough, to undertake the duty entrusted to him; and he has now presented his report.

Commencing with the present supply, it appears that in April last 1,358,500 gallons of water were being supplied daily to a population of 55,000, or at the rate of 24·7 gallons per day. The capacity of the pumping machinery was 2,200,000 gallons; and as during the drought of last summer no difficulty was experienced in maintaining an adequate supply, it may be concluded that, for the present at least, the quantity of water available is sufficient for the demand. But it is the future requirements which have to be considered. During the past ten years, the population has increased, on an average, 2·36 per cent. Assuming this rate to be maintained, in 1909 it will be about 70,000, and, on the basis of 25 gallons per head, they would require 1,750,000 gallons of water per

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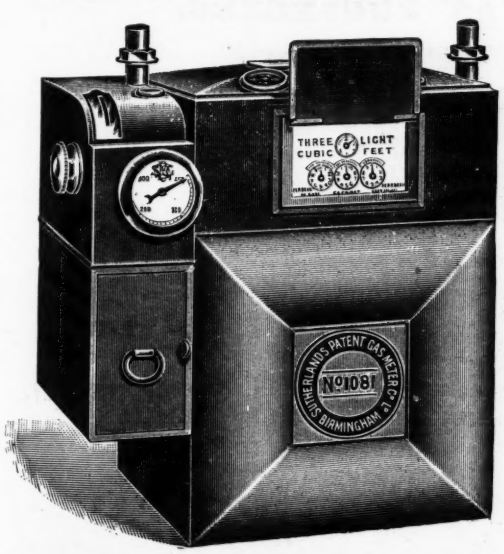

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diem; while in 1919 it will be 88,400, and 2,210,000 gallons will be needed. Mr. Griffith points out that these figures were obtained from averages over periods of twelve months; and the maximum day's demand during a dry season might very possibly exceed his estimate by as much as 100 per cent. The result would be that unless the Corporation had ample storage capacity to enable the pumping machinery to be kept constantly at work, the demand would exceed the supply in a much shorter period than the twenty years indicated—in fact, within the next ten years. Mr. Griffith therefore recommends the Committee not to put any arbitrary limit to the bulk of water to be sought from the proposed boring, but, on the contrary, to spare no expense to obtain the maximum quantity available.

Professor Hull estimated that from a boring 12 to 14 inches in diameter at a depth of 1200 feet from the bottom of the well, or 1400 feet from the surface, a supply amounting to about a million gallons per day of 24 hours would be obtained. Mr. Griffith has examined the data furnished by various borings, and does not feel justified in assuming any definite "rest level" at Boultham, as this would, he says, probably be considerably affected by the nature and condition of the sandstone in the immediate neighbourhood of the boring, and between its site and the outcrop of the sandstone. A trial boring would have to be carried to the base of the sandstone, and it should not be less than 6 inches in diameter at the bottom. It would cost about £4500, which would be in addition to the permanent boring; but he unhesitatingly recommends such a boring. As he estimates this to be about 2200 feet below the surface, he advises that the depth of the boring provided for in the contract should be based upon this figure; the minimum diameter at the bottom to be 12 inches. He estimates the probable section as follows: Mud and sand, with water (drift), 20 feet; lias, 533 feet; rhoetic shales, 22 feet; keuper marls, 810 feet; new red sandstone, 791 feet—total depth, 2176 feet. Although Mr. Griffith has arrived at the above figures after a careful study of all the available information upon the subject, he ventures to suggest that the opinion of Mr. De Rance should be obtained as to the accuracy or otherwise of his conclusions before the specification of the boring contract is prepared.

In the next section of the report, Mr. Griffith deals *seriatim* with the several strata indicated above, points out their characteristics, and suggests the best method of carrying out the boring with the view to overcoming the particular difficulties presented. In order to give the Water Committee a general view of his recommendations, he submits with his report a section showing the strata expected to be met with, and the construction of the work at the various depths; also a plan, indicating roughly the proposed arrangement of the boring and the engine and boiler house. He gives the time required to carry out the well and boring as from four to five years from the commencement; and his original estimate of the cost, inclusive of the Engineer's Commission and expenses (£300), was £15,500. But in a supplementary report he states that recent experience at Gainsborough makes it advisable to extend the tubing 400 feet, instead of 50 feet, into the sandstone, as he originally proposed; and that this alteration will add roughly about £850 to his figures.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

There was more than the usual tale of business at the monthly meeting of the Edinburgh and Leith Gas Commission this week. The first item had reference to an arrangement which has been come to, in respect of which the burgh assessment upon the new gas-works at Granton is to be restricted, and the Gas Commissioners are not to oppose the extension of the city boundaries of Edinburgh so as to include the works. A Sub-Committee had been appointed to attend to the interests of the Commissioners under the Bill of the Edinburgh Corporation. This Sub-Committee ascertained that the Edinburgh burgh assessment was 1s. 3d. per pound higher than is the county assessment, which the Commissioners would have to pay were the works not taken into the city. They resolved not to oppose the Bill if the Corporation of Edinburgh would agree to restrict their assessment upon the works, for 21 years, to the amount which would be payable to the county. A conference with representatives of the Edinburgh Corporation was held; at which the representatives stated that the concession could not be granted, but that the Corporation were prepared to restrict their assessment by one-third for a period of 15 years. This offer was rejected by the Sub-Committee, who despatched their Convener (Bailie Manclark, of Leith), the Engineer, and the Clerk to London, where they had a meeting with Mr. Kennedy, the Parliamentary Agent of the Commission, and a petition against the Bill was drafted. This was done post-haste; for a meeting of the Commissioners had been summoned, by desire of the Lord Provost of Edinburgh, for the following day. This meeting was held; and at it the Lord Provost explained that the Corporation were prepared to restrict the assessment to one-half for 17 years—dwelling-houses and subjects not forming part of the gas-works to pay full rates. The Commissioners unanimously accepted this proposal. At this week's meeting, a letter from the Town Clerk of Edinburgh was read, confirming the arrangement, but inserting Whitsunday, 1900, as the date of its coming into force, instead of, as had been agreed upon, the date of the passing of the Bill. The point was a matter of book-keeping; but it created some discussion—more than, presumably, would have taken place had there not been a little soreness over the fact that the Sub-Committee had been able, by their promptitude, to force the hands of the Corporation. Bailie Manclark remarked that the cost of the deputation to London was the best investment the Commissioners had ever made; and Mr. Kinloch Anderson said he thought the Commissioners were to be congratulated upon having the matter settled without going before a Committee in London. It was agreed that the arrangement should come into effect at Whitsunday. I hear of no other opposition to the Bill, which will most probably now pass as an unopposed measure. No one can yet say what the valuation of the new gas-works will be; but at present the Edinburgh works are valued at £42,000. As the Granton works are to supersede the Leith and Portobello works, as well as the Edinburgh ones, it is

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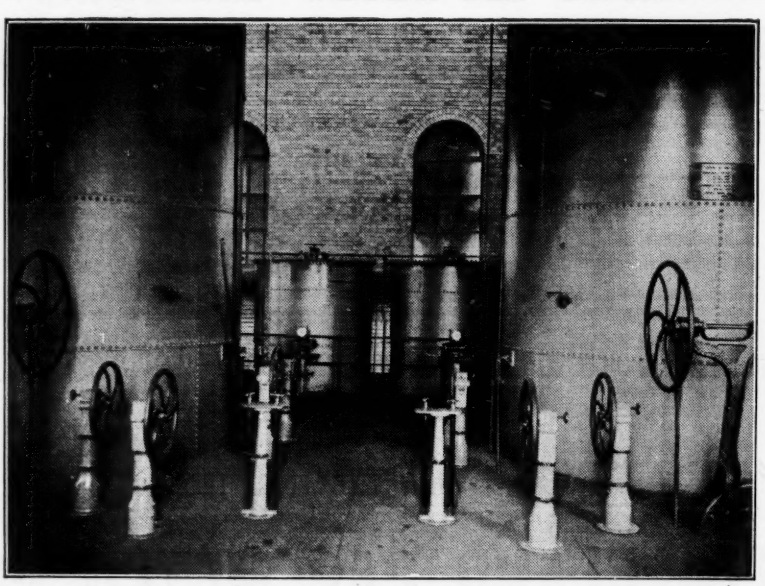

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reasonable to assume that they will soon be a considerable way over the present valuation in Edinburgh. The rate now in Edinburgh is 2s. 5½d. per pound. The saving, consequently, to the Gas Commission will be not less than £2500 a year, which is a matter of some importance.

The report by the Engineer (Mr. W. R. Herring) showed that the output of gas during January was 246 million cubic feet—an increase of 1,728,400 cubic feet over the corresponding month. The Commission have now 3922 cookers on hire—an increase of 972. Mr. Kinloch Anderson said it would be observed that, for the first time for many months, there had been a slight decrease in Edinburgh—945,000 cubic feet. The cause of this was not that there was any lack of demand; but, owing to the difficulty in getting coal, the Engineer was under the necessity of reducing the pressure as much as was prudent. It was a loss to them, but they had to take care of their coal. He did not wish to create an alarm about the coal-stores running down, because the Engineer had received supplies now, and there was no danger of their being short. The increase in the output of gas since May 16, had been 67,679,000 cubic feet, which he considered was wonderful. He heard that a good many people were cutting off the electric light, so that there was a prospect of this increase going on.

The Works Committee, Mr. Kinloch Anderson said, had considered an application by their yard labourers for a revision of wages. They recommended that the Commissioners should continue to recognize a differential rate of pay—the maximum being the standard rate (at present 5½d. an hour) payable to competent men, the wages being due for actual work only; that time-and-a-third should continue to be paid for Sunday labour; and that extra holidays be given after ten months' service. The recommendation was adopted.

It was reported by the Works Committee that arrangements had been made with defaulting coal contractors; and that there had been recently bought 1000 tons of Newbattle Parrot bottoms at 14s. 1d. to Edinburgh and Leith and 13s. 8d. to Portebello; 1000 tons of Carberry splint at 14s. 10d.; 500 tons of Pelton splint at 14s. 9d.; 1000 tons of Milton gas coal at 13s. to Edinburgh and Portobello and 13s. 3d. to Leith; 1000 tons of Balbardie gas coal at 15s. 3d. and 500 tons of Belhaven splint at 15s. 11d. to Edinburgh and Portobello, and 16s. 1d. to Leith. I understand that some of these prices are 50 per cent. higher than they were a year ago.

Then arose an incident which deserves more than a passing notice. Mr. Kinnaird, of Leith, said, seeing that the period for contracting was coming on, he wished to ask whether the self-denying ordinance applied to members of the Commission who were financially interested in limited liability companies supplying materials to the Commission. Mr. Steel said the subject had been raised often in the Commission. Mr. Kinnaird said he had been seven years in the Commission; and he had looked over the minutes, but could see no reference to it. The Clerk (Mr. J. M'G. Jack) replied that there was a section in the Commissioners' Clauses Act of 1847, which had been incorporated in their Act, and which provided that limited liability companies might contract with the Commissioners; but no Commissioner who was interested in such a company was entitled to take part in the fixing of the contract. The Chairman (Provost Mackie, of Leith) remarked that this had always been observed. Mr. Kinnaird said there was a gentleman present who was a director of a company who were supplying material to the Commission. This gentleman was asked to go out of the room when the contract was being fixed; and the whole of the contract fell to his company. He thought that if a member of the Gas Commission were there, and using influence on the members, it was contrary to the spirit of the Act. He should not be there at all, or even be a Commissioner. Mr. Kinloch Anderson said he was sure that if a contract had ever been given to a company in which any Commissioner was interested, it was because they were the lowest tenderers; he was perfectly certain that no consideration was ever given to any Commissioner. Mr. Kinnaird pointed to an instance in the minutes before them, where, a Commissioner having acquired the business of a limited liability company, this company had been paid for goods supplied to the Commission; and he asked if it was right that this should take place. He wished the principle to be settled. Mr. Kinloch Anderson said that if a Commissioner were the sole owner of a business, the self-denying ordinance would certainly apply. But in this instance, the gentleman had purchased the business as an investment, and did not manage it himself; and it was quite likely that he knew nothing about the supplying of goods to the Gas Commission. It was agreed that the Clerk should look into the law upon the subject, and inform the Commission whether it forbade only directors of companies, or shareholders as well, from taking part in business in which their company was interested. The late Professor Blackie said it was a misfortune to be possessed of too tender a conscience. I am afraid that Mr. Kinnaird labours under this misfortune. I do not think that the laying down of any general principle which would have the effect of excluding the best business men in the country from public boards would be serving the public interests. General principles, no matter how well they may look upon paper, cannot be made applicable to every case. It is, in such matters as this, the duty of those who wish to preserve purity to watch each particular case. Had Mr. Kinnaird challenged a contract at the time it was being entered into, his position would have been unassailable. But he did not do so; and it is to be assumed that he saw nothing wrong. If for seven years he has been unable to detect a corrupt contract, it is inexplicable why he should begin to fear them now. At least, he gave no reason; and it can only be concluded that he acted without reflecting that the consequences, were he to secure what he seemed to be aiming at, might carry him further than he desired, and would, of a certainty, not be to the benefit of the gas undertaking.

The ground upon which the gas-works at Hamilton are erected is held by the Corporation on a long lease, of which there is still about 30 years to run. The Gas Committee have been considering the desirability of acquiring the land; and this week they have recommended the Town Council that negotiations should be entered into to this effect. Mr. Tainsh, who is not one of the most advanced public men in Hamilton, thought the matter was one for their successors to settle, nearer the end of the lease; and he moved that the recommendation be not adopted. He did not find a seconder; and the negotiations will proceed. It is

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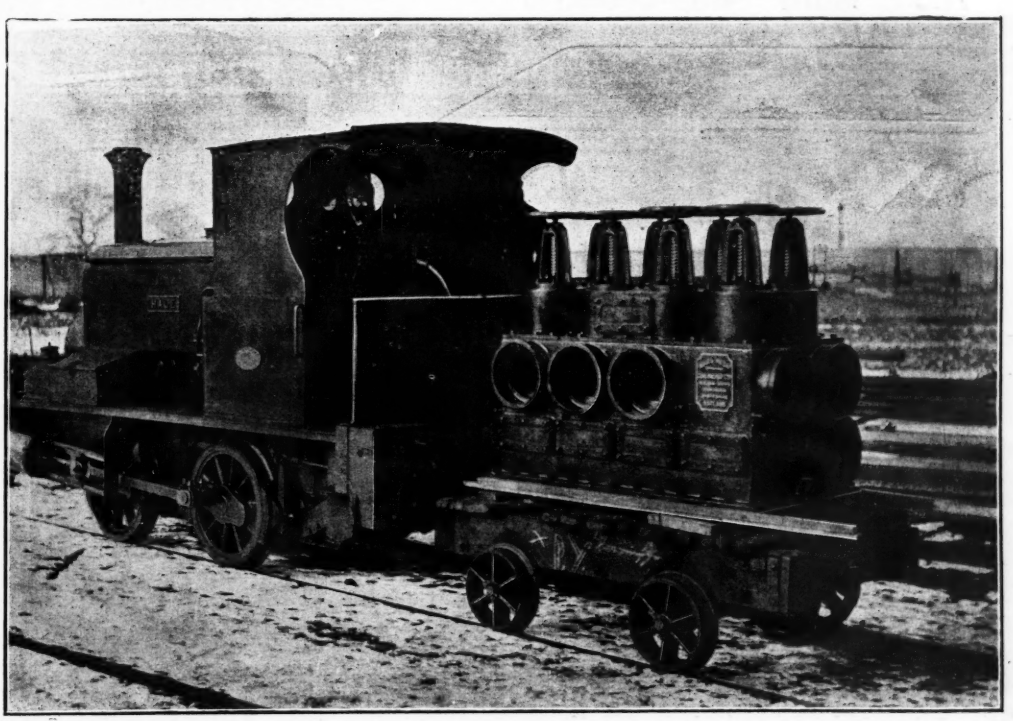

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most certainly a wise step to come to some understanding in good time. Were the Corporation to wait till near the end of the lease, the proprietor could make his own terms; but if they begin in time, the Corporation will have it in their power to play off the possibility of removing against any unduly heavy conditions. Of course, on the other hand, it might pay the proprietor to get the gas-works cleared away from his land; but such questions will be considered in the negotiations.

Cross petitions have been presented to Parliament with reference to the Bills affecting the Falkirk district which are being promoted. The County Council of Stirlingshire petition against both the Bill of the Falkirk and District Water Trustees and that of the Falkirk Corporation for the extension of the burgh boundaries. With reference to the Water Bill, they object to the Falkirk Water Trustees being allowed to appropriate the more populous areas in the neighbourhood of the burgh—leaving to be supplied by the County Council the more sparsely peopled localities. They oppose the proposals of the Corporation for the extension of the burgh boundaries, on the grounds that the extension would entail loss of revenue to them, and would dislocate their arrangements for the administration of the Public Health and other Acts. The proposed extensions include the two sites which are suggested for the new Corporation gas-works. On the other hand, the Town Council petition against the Bill of the County Council for the supply of water to villages and populous areas in the eastern district of the county, and contend that it is desirable that there should be included within the burgh all the areas which are at present supplied with water or gas from the town undertakings. These Falkirk measures are likely to be the most stubbornly contested of all the Scotch Bills in Parliament this session.

A little episode in the working out of electric lighting problems, which I suppose has now closed, may be given. On the 13th ult., speaking in the Edinburgh Town Council, Bailie Mackenzie, who is Convener of the Electric Lighting Committee of the Corporation, said that the Treasurer and other members of the Corporation had expressed a fear that undue capital expenditure was going on in the electric light undertaking of Edinburgh. He had prepared a statement of comparison with other similar large undertakings, which might be interesting. The latest published accounts showed that up to May last Edinburgh had expended £395,356 on the electric light undertaking, and had connected with its system equivalent to 226,740 8-candle power lamps—thus giving a capital expenditure of £1 15s. per lamp. Glasgow at the same time had spent £339,782, with 139,772 lamps joined on—giving a capital expenditure of £2 8s. per lamp. Dundee shows an expenditure of £1 13s. per lamp, Aberdeen £1 14s. 6d., Manchester £2, Liverpool £3 4s., Leeds £2 18s., Birmingham £2 10s., Sheffield £3, Dublin £2 14s., Belfast £2 8s, and Brighton £2 4s. The large London Companies show an expenditure as follows: The City Company (the largest in the country) has a capital expenditure of £3 18s. per lamp, the Metropolitan Company (the next largest) £2 12s., and the Westminster Company £2 6s. None have a smaller expenditure per lamp than Edinburgh. He hoped this would reassure the members of Council that the work in Edinburgh had been done economically, and, notwithstanding a few slight interruptions, efficiently carried out. This statement was called attention to in the Glasgow Town Council; and Bailie M'Lay, the Convener of the Electricity Committee, pointed out that a comparison between the two cities was scarcely possible. For one thing, the public lamps in Glasgow were kept lighted all night; whereas in Edinburgh they were not. This week Bailie Mackenzie was asked what the capital expenditure per lamp was as at the 15th ult.; and in reply he said that since May last about £100,000 had been expended upon the new station at M'Donald Road. The total capital expenditure was, at the 15th ult., £545,981. This brought out the cost per lamp at the present time to £1 18s. 4d. He pointed out that 20,000 lamps were waiting to be attached; and that during the year ending May 15 next the number of lamps joined on would be 70,000—a number never heard of in connection with any other undertaking of the kind in the country. The cost per lamp would thus go down after May. The closing scene came in the Glasgow Town Council on Thursday of this week, when a member conveniently asked if Bailie M'Lay was in a position to give any explanation of the recently published comparison between Glasgow and Edinburgh. Bailie M'Lay's reply was that the figures of Bailie Mackenzie were not accurate; he gave the number of lamps in Glasgow as 137,772; whereas the correct number was 191,062—a difference in favour of Glasgow of 53,290. This correction made all the difference in the world. It reduced the capital cost from £2 8s. to £1 15s. 1d. In Edinburgh, according to its own figures, the cost was £1 14s. 10d.—a difference of 3d. in favour of Edinburgh, which was not worth speaking about. Apart from this, he found that Bailie Mackenzie had revised his figures, and now he made the cost of each lamp in Edinburgh £1 18s. 4d.; whereas the cost in Glasgow was £1 15s. 1d.—a difference in favour of Glasgow of 3s. 3d. Bailie M'Lay went on to say that the comparison made between the two cities was unfair and unreliable, because, particularly in Glasgow, and in Edinburgh to some extent, they were in a state of transition. They were in the stage of development, and they were spending capital freely. This statement has given nearly as much satisfaction in Glasgow as did the information about the relief of Ladysmith. With the question as between the two cities I have no concern; but a comparison with gas lighting brings out how costly a matter lighting by electricity is, after all is said in its favour. And, first, it has to be observed that the electricians make their calculations at per 8-candle lamp. There is, in practice, no such lamp in gas lighting. As a matter of fact, it is seldom indeed that a gas-lamp is to be met with which is of less capacity than 16 candles. Thus, at once, in a comparison of cost per lamp, as between gas and electricity, the cost of the electric lamps as given, must be doubled. But even taking the figures as they are given, I find that gas lighting is less than the electricians claim for theirs. The published accounts of the Glasgow Corporation give the total expenditure upon works, including workshops, offices, chemical works, and dwelling-houses, at £1,315,610; and the parliamentary return gives the number of consumers as 186,327. This does not take public lamps into account, as the electricians do. The number of private lamps is not given; but if five be taken as an average per consumer (which is probably under the mark), it is found that the capital cost per lamp is £1 8s. In Edinburgh (excluding the cost of the Granton works in course of construction), the outlay upon works has been £767,620, and the number of consumers is 74,964;

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giving the number of lamps as 374,820, and the capital cost per lamp £1 14s. In the case of gas, too, the whole area of supplies, to their most outlying and most thinly peopled limits, are served; while with electricity only the central districts—the best revenue producing ones—have yet been served. When, if ever, the outlying districts are supplied with electricity, the capital account will be of huge proportions; and the cost per lamp will certainly not be anything like the figures which both electrical conveners look upon as being so small.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *March* 3.

Sulphate of Ammonia.—There has been a firm market, and values have hardened slightly; the closing quotations being £12 1s. 3d. to £12 3s. 9d. per ton, delivered f.o.b. at the ports. Consumers have bought sparingly; there being still a disposition to wait a better opportunity. Purchasing has consequently again been for "cover" purposes; but it has been sufficient to absorb available supplies, and February closed with bare stocks. There has been a considerable speculative interest in the forward position; and £12 per ton March-May, and £11 12s. 6d. October-March, has been paid, ordinary terms, f.o.b. Leith. London quotation for delivery over the spring months is £12 per ton, Beckton terms; but so far this price has not been paid.

Nitrate of Soda is firmer; and the spot quotations have been advanced to 8s. 10½d. per cwt. for ordinary, and 9s. for fine quality. The visible supply is considerably less than at the same date last year; and a further advance seems probable.

LONDON, *March* 3.

Tar Products.—There is not such a keen rush for carbolic acid; but it is believed that many dealers have orders up their sleeves, and are in the meantime attempting to depress the market value. Distillers have no stocks of carbolic in any form; and many of them oversold have been tempted to do so by the higher prices recently obtaining. Benzols are dull; but larger shipments to the Continent are taking place. There is a better demand for 50's than 90's—doubtless due to the enlarging consumption of toluol for indigo manufacture. Solvent naphtha is not quite so strong; while heavy naphtha is quoted less money. Good business exists for creosote and other tar oils. There is no change in value. Anthracene is in better inquiry. The average values are: Tar, 17s. to 26s. Pitch, east coast, 35s. 6d.; west coast, 33s. 6d. Benzol, 90's, ordinary, 7d.; special qualities for gas, 8½d.; 50's, 9½d. Toluol, 90's, 1s. 2d.; pure, 2s. Solvent naphtha, 1s. 2d. Crude, 30 per cent., naphtha, 4¾d. Heavy naphtha, 1s. Creosote, 3¼d. Heavy oils, 3¾d. Carbolic acid, 50's, 2s. 8d.; 60's, 3s. 1d. Crude naphthalene, 60s. Anthracene, nominal, "A," 4d.; "B," 2½d.

Sulphate of Ammonia still enjoys a steady market. The position of stocks in this country are such as to warrant the belief that values will be maintained during the spring. Indeed, there are numerous offers at to-day's price for forward delivery, without finding sellers. Makers would probably accept £12 5s. per ton for the spring months; but for spot delivery £12, less 3½ per cent, is the price at all points.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—No really material change can be reported in the position of the coal trade here. An active demand still comes forward for practically all descriptions of fuel; any falling off—and this is not appreciably felt—being simply in the better qualities of round coal suitable for house-fire purposes. There is, however, a continued easing down from the special prices that have recently been ruling in the market; and it is now exceptional where buyers are prepared to pay anything above the normal list rates to secure supplies. The best house-fire varieties are, if anything, rather more plentiful; but all the lower qualities of round coal that can be used for steam and general manufacturing purposes are meeting with a ready sale, with supplies only barely sufficient for requirements. Much the same also applies to engine fuel, in which, though there is perhaps not the scarcity reported recently, the output of the pits is still short to meet full demands. From outside districts there is a larger quantity of fuel coming forward, which is enabling consumers who are in the open market to meet their wants without having to pay special prices, or to purchase house-fire qualities at full rates for steam and forge consumption. Taking the position all through, although it is strong at the full list rates, there is a disappearance of the special prices which collieries have been securing in the outside markets. At the pit, average rates are about 14s. 6d. to 15s. 6d. per ton for best house coal, 13s. to 14s. for medium qualities, 12s. to 12s. 6d. for steam and forge coals, and from 10s. for medium to 11s. for best slack. For shipping, there is still a pressure of demand; and with only limited supplies obtainable, prices above those ruling for inland sale are still being secured without difficulty. Delivered at the ports on the Mersey, ordinary steam coals are fetching 15s. 6d. to 16s. per ton; and better qualities of round coal 17s. per ton. There is still more inquiry for coke than makers can entertain; but there is no official change in prices, which remain at about 23s. to 23s. 6d. per ton at the ovens for furnace, and 30s. for best foundry cokes. There is apparently a disinclination to make any further upward move on list rates.

Northern Coal Trade.—There has been some ease in the coal trade, and prices are occasionally lower than a week ago. Best Northumbrian steam coals are now quoted from 17s. 6d. to 18s. 6d. per ton f.o.b., second-class steam are about 9d. lower, and steam smalls are 11s. In the gas coal trade, the deliveries are still heavy, though less than they were, except where the making-up of the quantities that were deficient is being effected. Prices for occasional cargoes vary from 16s. to 16s. 6d. per ton f.o.b.; but there is comparatively little being sold that way. Very little has been done in regard to contracts this week; and as far as is known, the negotiations for the renewal of the large contracts for the South have not yet been entered upon. In coke, the market is brisk, and the prices are firm, with an upward tendency. Gas coke is steady; and the output is well taken up. Prices show little alteration.

Scotch Coal Trade.—The demand is getting bigger—as the opening of the Baltic ports draws near. Forward contracting is actively sought

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for; quite satisfactory prices being offered. Current rates remain firm. In some places, the miners are not working steadily, which is interfering with the output. The prices quoted are: Main 14s. 6d. to 14s. 9d. per ton f.o.b. Glasgow, ell 15s. 9d. to 16s. 6d., and splint 15s. 3d. to 15s. 6d. The shipments for the week amounted to 198,076 tons—an increase of 9041 tons upon the previous week, and of 59,038 tons upon the corresponding week of last year. For the year to date, shipments have been 1,400,520 tons—an increase of 313,151 tons upon the same period.

Compensation to an Injured Workman of the Manchester Gas Department.—At the meeting of the Manchester Corporation Gas Committee last Friday, the question of granting some compensation to William Wall, a workman at the Bradford Road station, who recently lost the sight of one of his eyes owing to a piece of cannel flying into it, was considered; and it was ultimately decided to pay him £150 in settlement of all claims.

Sales of Shares.—A few additional shares in the Plymouth and Stonehouse Gas Company were lately sold by auction at from £21 10s. to £22 15s. each. The fourth batch of 1500 £5 shares in the Portsmouth Water Company, authorized by the Act of 1898, were recently sold by Messrs. Hall and Paine, at Landport. They were put up in 300 lots, 280 of which were sold at £6 15s. per share. The next three lots were sold at an advance of 2s. 6d. per share; but the price realized for the remainder was £6 15s. per share. The sale produced £10,128 15s.; being a premium of £2628.

New Joint Stock Companies.—The Portable Gaslight Company, Limited, has been formed, with a capital of £12,000, in £1 shares, for carrying on business of the nature indicated in the title. The Flameless Gaslight Company, the registration of which is announced, consists of 20 members, each liable for £1, who purpose carrying on the business of gas engineers, &c. The National Gas-Engine Company (1900), Limited, has been registered with a capital of £200,000, in £1 shares, to acquire and take over, as a going concern, the business now carried on at Ashton-under-Lyne by the National Gas-Engine Company, Limited.

Carburetted Water-Gas Plant for the Oldbury Gas-Works.—At the meeting of the Oldbury District Council last Friday, the Gas Committee presented a report in which they recommended that water-gas plant should be laid down in accordance with plans, specifications, &c., approved by them, and that the estimate of the Economical Gas Apparatus Construction Company, Limited, amounting to £5663, be accepted for carrying out the work to the satisfaction of the Gas Engineer and Manager (Mr. A. Cooke). The Committee considered such plant would best fulfil the present needs of Oldbury, and would avoid heavy expenditure on additional holders, &c. The Chairman of the Committee (Mr. J. W. Wilson, M.P.), in moving the adoption of the report, explained that the Committee felt they would not be prepared to face another winter unless steps were taken to increase the productive capacity of the gas-works. The report was adopted.

Increases in Price.—The Milton Urban District Council have resolved to raise the price of gas by 3d. per 1000 cubic feet. The Welshpool Gas Company are about to raise the price of gas from 3s. 9d. to 4s. 2d. per 1000 cubic feet.

Harrow and Stanmore Gas Company.—At the half-yearly general meeting of this Company yesterday, the accounts presented showed a balance of £3121 available for distribution. The Directors recommended a dividend for the past six months at the following rates per annum: 8 per cent. on the "A" capital, 7 per cent. on the "B" capital, £5 12s. per cent. on the "C" capital, and 6 per cent. on the guaranteed shares—all less income-tax. This was agreed to.

The Sunlight Company and the Chimneyless Burner Patent.—We learn that the Law Officer last Thursday dismissed the Welsbach Company's appeal from the decision of the Comptroller of Patents, by which he allowed the Sunlight Company to amend the De Mare patent for their chimneyless burner. That Company, who claim that the Law Officer's action gives them the master-patent for the principle of a chimneyless burner, have commenced proceedings against the Welsbach Company for infringement of the De Mare patent by the manufacture and sale of the new Welsbach (Kern) burner.

The Hemel Hempstead Corporation and the Water-Works.—At a special meeting of the Hemel Hempstead Town Council held last Wednesday, it was decided to undertake all necessary expenses and steps for promoting a Bill to secure the purchase of the property of the Hemel Hempstead Water-Works and Laundry Company, Limited. A cheque for £200 was ordered to be paid to the Parliamentary Agents for fees at the different stages of the Bill in the House of Lords. The expenses of the poll of owners and ratepayers came to £58, and were ordered to be paid. Mr. Fisher said the majority in favour of the purchase was only 17; but if it had been on the basis of "one man one vote," they would have had a majority of 115. Still, they did not employ any paid canvassers, and had to contend against tremendous odds. The Council sealed a petition against the Great Berkhamsted Water Bill.

Cagliari Gas and Water Company, Limited.—At the ordinary general meeting of this Company to-day, the Directors will report that the receipts on revenue account amounted last year to £25,138, and the expenditure to £14,843; leaving, after the usual deduction for sinking fund, a net revenue of £10,295. The amount available for distribution, including the balance brought forward, is £14,523, out of which an interim dividend at the rate of 6 per cent. per annum was paid for the six months ending the 30th of June, and the Directors recommend one at the rate of 8 per cent. per annum for the past half year (making 7 per cent. for the year), together with a bonus of 2s. 6d. per share. These payments will absorb £11,437, and leave £3086 to be carried forward. The water revenue shows an increase over the year 1898; but the expenditure was greater by £596. There was a considerable rise in the gas revenue—£883—as compared with the preceding year; while the expenditure was only £630 more. The unaccounted-for gas averaged 4·9 per cent. of the make over the whole year. The electric lighting undertaken by the Company produced a larger profit last year than it did in 1898.

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Lancaster Gas and Water Supply.—At the meeting of the Lancaster Town Council last Wednesday, it was stated that the gas profits applicable in aid of the rates were expected to be £1000, and the water profits £3417—in both cases exceeding the estimates of the departments.

Manchester Water Supply.—The Manchester Corporation Water Committee, at their meeting last Thursday, presided over by Alderman Sir John J. Harwood, again discussed the question of laying a second pipe from Thirlmere. They passed a resolution expressing the opinion that the time has arrived for the matter to receive serious attention, and referring it to the Thirlmere Sub-Committee for the purpose of investigation, with the view of bringing the scheme before the Council, and also with authority to carry out the engineering arrangements. The consumption of water supplied by the department is still very high. In the week ending the 24th ult., the daily average was 33¾ million gallons. The stock is deemed to be sufficient for 122 days; seven days' supply having been gained during the last fortnight. At the corresponding date last year, the stock was less; but the consumption also was less. The daily need for the year is now estimated at 32½ million gallons.

The "Builder" on London Gas.—In the course of some editorial remarks on the approaching contest between the London County Council and the Metropolitan Gas Companies concerning the official recognition of the portable photometer, our contemporary points out that the legalization of this instrument with the retention of the 16-candle standard would necessitate the supply of a more highly enriched gas, which in turn would result in an immediate rise in the price charged; while the consumer who obtained the richer gas at a higher figure would not get a proportionate increase in lighting or heating value for his extra expenditure. As an aid to smoke abatement, and in the interests of manufacturers and gas consumers generally, our contemporary expresses the opinion that "the supply of a low-grade gas—say of 14½-candle power—at a minimum pressure of 1½ inches of water, and possessing a minimum calorific value to be fixed by Act of Parliament, would be of more utility than the supply of a higher grade gas of uncertain heating value at a higher price."

Destruction of the Grand Theatre, Islington, through a Gas Explosion.—On Monday last week, the Grand Theatre, situated close to the Angel, Islington, was almost totally destroyed by fire. It broke out about eleven o'clock in the morning, and was attributed by Commander Wells to the gas arrangements on the stage. For the purpose of scenic effect, a series of gas "battens," supplied by pilot lights, were fixed at various heights in the "flies." On the previous Saturday night, in accordance with the usual custom, the whole of the pilot lights were shut off, to be relighted on Monday morning in preparation for the evening performance. It was when the workmen were engaged in this operation that the fire broke out. It is believed that the gas was turned on for the "battens," and not immediately lighted; the result being an escape. The "long arm" of the operator came in contact with the escaped gas, and the result was a report, which was heard all over the building. The explosion is believed to have shattered a stage "avalanche" used in the piece, and the inflammable material of which it was composed caught fire. The curtain having been raised shortly before, and the windows and doors on the stage and the skylights in the roof being open, there was a strong draught, which quickly spread the fire to the scenery. The result was that the stage was in a few moments a mass of flames. The scenery and the back part of the building were burnt out, and part of the roof was destroyed, with the rest of the auditorium, refreshment-rooms, &c.; and the contents were severely damaged by fire, water, and breakage. Fortunately no personal injurieswere sustained.

The "London Gazette" last Tuesday contained an announcement that the Malvern Link Gas Company had been wound up voluntarily.

At St. Bartholomew's Parish Room, Bristol, last week, an exhibition of gas appliances was held by Messrs. Fletcher, Russell, and Co., Limited, with lectures by Miss Helen Edden.

The Directors of the Abingdon Gas Company have entered into a contract with Messrs. Gibbons Bros., of Dudley, for the erection, during the coming summer, of their system of regenerative furnaces.

The Directors of the British Gaslight Company, Limited, propose to recommend at their half-yearly meeting on the 21st inst., a dividend at the rate of 10 per cent. per annum for the six months ended Dec. 31, free of income-tax.

Messrs. Wilsons and Mathiesons, Limited, of Leeds, held an exhibition of their gas cooking and heating appliances at the Denison Hall, Armley, last week. Miss Holroyd delivered a series of cookery lectures, with practical illustrations.

Messrs. Hooker and Webb announce the sale by auction, at the Greyhound Hotel, Croydon, on the 15th inst., of £5000 of consolidated "B" ordinary stock and £2500 perpetual debenture stock (5 per cent.) of the Croydon Gas Company. The dividend paid on the "B" stock for some years has been at the rate of 11 per cent. per annum. The stock will be offered in 85 lots, divided into parcels of £100 and £50 each for the convenience of purchasers.

The Patent Paraffin Gas Lighting Company, Limited, of Glasgow, have lately put down a considerable number of installations of their oil-gas lighting plant for mills and mansion houses. Among the places fitted up during last summer and autumn outside Scotland were Powerscourt Castle and Hollybrooke House (Co. Wicklow), Lyons House (Co. Kildare), and the Calver Mills, Derbyshire. At present they have an order from His Grace the Duke of Sutherland, for Dunrobin Castle, Sutherlandshire. In this case the plant is to supply gas for the cooking as well as for the lighting of the castle.

At the meeting of John Wright and Co., Limited, next Thursday, the Directors will report that the profit for the past year, after further strengthening the internal reserves and charging debenture interest, Directors' fees, and Managing Directors' salaries and commission, amounts to £20,432. After adding the balance brought forward (£5759), and deducting the interim dividends paid in July last, there remains for disposal £21,451. The Directors have had brought under their notice the appeal to local manufacturing firms and companies for contributions towards the endowment fund of a University for Birmingham; and they suggest that a sum of £500 be given as a donation in aid of the scheme. The Directors recommend that the balance standing to the credit of the profit and loss account be appropriated as follows: Dividend at the rate of 6 per cent. per annum on the preference shares (less income-tax), £1740; dividend at the rate of 10 per cent. per annum on the ordinary shares (free of income-tax), £3000; a bonus of 10s. per share on the ordinary shares, £6000; addition to reserve, raising the fund to £15,000, £5000; endowment fund of the proposed University, £500—leaving £5211 to be carried forward. Surplus funds (£10,514) were invested during the year in debentures of the Company and first-class securities.

The annual general meeting of Richmond and Co., Limited, was held last Tuesday, at the Company's works at Stratford—Mr. E. W. T. Richmond, the Chairman and Managing Director, presiding. In moving the adoption of the report, noticed last week (p. 564) the Chairman expressed his pleasure at being able to inform the shareholders that the Company's sales for 1899 were 50 per cent. more than those for 1898. At the last meeting, he announced that the Plymouth and Stonehouse Gas Company had entered into a contract with the Company; and he was now pleased to state that in the past year they had secured a large contract at Dublin, and that the premises were open and doing an increasing business. He had only that morning come from Bournemouth, where they had obtained another important contract. The increase in the Company's business had been something phenomenal. Ten years ago they had very small works; and now they were paying over £50,000 a year in wages and salaries. The report and accounts were unanimously adopted; and dividends of 6 per cent. on the preference shares and 10 per cent. on the ordinary shares were declared. An extraordinary meeting was afterwards held at which a further increase of share capital was unanimously sanctioned.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

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Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.
MELROSE CYCLE COMPANY, COVENTRY.

WANTED, a Situation as Manager of Small Works or FOREMAN of Medium-sized Works. Good experience of modern Works, and excellent Testimonials.
R. ELLERSHAW, Gas Manager, SOLIHULL.

WANTED, a Situation as Assistant GAS MANAGER. Could undertake erection and working of Tar-Distilling Plant; also Ammonia and Sulphate Making.
Address No. 3442, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ADVERTISER (aged 30), experienced, and well connected in Inland and Export Gas Coal Trade, &c., desires APPOINTMENT. Chartering, French and Spanish, accustomed to Travelling, &c. Highest References.
Address No. 3446, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the Advertiser, a Situation as MANAGER of a Small Gas-Works or FOREMAN of Medium-Sized Works. Thoroughly understands Retort-House Work. Can read and fix Meters, lay Services, and do inside Fitting, and is well up in the working, &c., of Slot Meters.
Address No. 3443, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a competent Gas-Fitter. Wages 30s. per week.
Send full Particulars as to Experience, Age, &c., to Mr. P. H. FLETCHER, Engineer, Gas-Works, EVESHAM.

WANTED, a first-class Sulphate MAKER. Must have experience with Schwab's Sulphate Plant. Must be steady and reliable. Wages 35s. per week.
Apply, by letter, to No. 3447, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a first-class Man as General FOREMAN at important Gas-Works. One with Mechanical training and knowledge of modern Gas Plant and Manufacture preferred.
Apply, by letter, stating Age, Wages required, and References, to No. 3444, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, at once, for a Small Gas- Works, a steady Man as STOKER. Must be used to Shovel Charging and Engine and Exhauster. Wages in Summer 25s.; in Winter 28s. A permanency to a good Man. Reference required.
Apply, by letter, to No. 3445, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ASSISTANT Manager wanted for the Manufacturing and Trading Departments. It is requested that only those will apply who possess a thorough practical knowledge, and have had experience in a similar appointment.
Applications, which must be made by letter (marked "Private"), must state full details of Experience, References, and Salary expected, and be addressed to the MANAGING DIRECTOR, the Welsbach Incandescent Gaslight Company, Limited, York Street, Westminster, LONDON, S.W.

WANTED, a Young Gas-Fitter of good address to act as METER INSPECTOR and SLOT METER COLLECTOR, filling up spare time in fixing Cookers, attending to Incandescent Lamps, and general House Fitting. An Abstainer preferred.
Apply, with Testimonials, and stating Wages required, to No. 3441, care of Mr. King, 11, Bolt Court FLEET STREET, E.C.

NEWPORT (MON.) GAS COMPANY.

WANTED, a Junior Draughtsman. Apply to the undersigned, stating Age, Experience, and Salary required, with *copies* of not more than three recent Testimonials, on or before the 17th of March next.
THOMAS CANNING,
Engineer and Manager.
Engineer's Office, Newport, Mon.,
March 2, 1900.

NEWPORT (MON.) GAS COMPANY.

WANTED, at once, a Ledger Clerk, not over 30 Years of Age (one accustomed to Gas Ledgers preferred). Progressive Salary, commencing £90.
Applications, stating Age, and enclosing *copies* of Testimonials, to be sent, endorsed "Application for Ledger Clerk," not later than the 12th of March, 1900.
EDWARD F. MARFLEET,
Secretary.

BROADSTAIRS GAS COMPANY.

WANTED, at once, by the Directors of this Company, an Experienced and Competent GAS MANAGER and SECRETARY, to take immediate charge of their Works. He must have a practical knowledge of the Manufacture of Coal Gas, Sulphate of Ammonia, and the Laying of Mains and Services, and to have entire control of the same. Salary £200 per annum. Residence, Rates, Coal, and Gas free.
Applications must be made in Candidates' own handwriting, accompanied by three Testimonials of recent date, and addressed to the Chairman of the Broadstairs Gas Company, not later than March 13, 1900.

URBAN DISTRICT COUNCIL OF PONTYPRIDD.
(GAS DEPARTMENT.)

THE Urban District Council of Ponty- pridd are prepared to receive APPLICATIONS for the position of ENGINEER and MANAGER of their Gas-Works. Candidates must possess a thorough knowledge of the Manufacture and Distribution of Gas on the most modern principles. The person appointed must devote the whole of his time to the duties, which will include the preparation of all Books appertaining to the Management. Age not to be under 25 years, or over 45 years.
Salary at the rate of £3 10s. per week, with House, Coal, Gas, and Rates and Taxes free.
Applications, in Candidates' own Handwriting, accompanied by *copies* of three recent Testimonials, to be forwarded to me, the undersigned, marked "Manager," not later than Monday, the 19th day of March, 1900.
Canvassing will be deemed a disqualification.
MONTAGUE H. GROVER,
Clerk to the Council.
Council Offices, Pontypridd,
March 2, 1900.

THE DERWENT VALLEY WATER BOARD.

APPOINTMENT OF ENGINEER.

BY the Derwent Valley Water Act, 1899, the Derwent Valley Water Board are authorized to construct six large Reservoirs in the Valleys of the Derwent and the Ashop in Derbyshire, together with important subsidiary Works in connection therewith to deal with an estimated flow of Fifty Million Gallons of Water per day. The Reservoirs will be constructed successively; and the execution of these and the other authorized Works is expected to occupy many Years.
Applications are now desired for the position of ENGINEER to the Board. The Engineer will be responsible for the Designing and Construction of the Works. He will be required to reside in the neighbourhood of the Works, and to devote the whole of his time to his duties under the Board, and to have daily personal charge of the work in hand. The staff of Assistants, Inspectors, Draughtsmen, Clerks, and others necessary in the carrying out of the work will be provided by the Board, and be under the direction of the Engineer.
The engagement will (subject to the services rendered being satisfactory) be certainly until the first two Reservoirs are completed (this work it is estimated will take some Ten Years to carry out), and may be a permanent one. The Engineer on his part will be required to enter into an agreement to remain in the exclusive service of the Board until the first two Reservoirs are completed. The Board reserve the power of determining the engagement with the Engineer on giving him Six Months' Notice, in case his services are not considered satisfactory.
It is indispensable that Candidates for the appointment should have had considerable experience in designing and constructing Reservoirs and Gravitation Water-Works.
The Board reserve the right (which they will probably exercise) to appoint, or take the opinion of, a Consulting Engineer or Consulting Engineers on the Works, when and as desired.
Each Applicant must furnish at least two References and *copies* of Testimonials (which cannot be returned, and which preferably should be printed); the Board having the right to call for the production of the originals.
Applicants must state Age, Experience, Present Position, Salary required, when at Liberty, and general state of Health. Personal Canvassing will be a disqualification.
Communications to be sent to me not later than the 10th day of March, 1900, marked on the outside "Derwent Valley Engineer."
JAMES BELL,
Clerk to the Board.
Rowton Buildings, Bowling Green Street,
Leicester, Jan. 17, 1900.

DRAUGHTSMAN Wanted, for General and Constructional Engineering work.
State Age, Experience, and Salary required to WEST'S GAS IMPROVEMENT COMPANY, LIMITED, Albion Iron-Works, Miles Platting, MANCHESTER.

WANTED, a good steady Man as RETORT-HOUSE FOREMAN, accustomed to the control of Men, and with an Experience of Generative Settings.
Wages £2 2s. per week.
Make of Gas 350 millions per annum.
References (not Testimonials) only required.
Apply, by letter, to No. 3437, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a 30,000 cubic feet per hour EXHAUSTER, with Engine combined. New or good second-hand.
Apply, with full Particulars, to W. SMITH, Gas-Works, AYR, N.B.

FOR SALE—A 60-inch Letheby-Bunsen PHOTOMETER, and complete TESTING APPARATUS for Sulphur and Ammonia. All new in 1895.
Apply to H. MATTHEWS, Gas Examiner, CHELTENHAM.

ENGINES and Exhausters, from 1500 to 30,000 cubic feet per hour, in Stock, ready for delivery. No reasonable offer refused.
J. F. BLAKELEY, Thornhill, DEWSBURY.

LIVESEY Washer, 1 Million per diem, 18-inch Valves. MORRIS & CUTLER'S CONDENSER, 18-inch Valves. All in perfect order, and cheap.
J. F. BLAKELEY, Thornhill, DEWSBURY.

BOILER Tanks, several good ones. CAST SCRUBBER, 10 feet diameter by 20 feet (would make splendid Tank); also others. Two VERTICAL ENGINES. ROTARY EXHAUSTERS. Cheap to clear.
FIRTH BLAKELEY, Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE — A Washer by Cockey. Size 10 ft. by 4 ft. 9 in. by 3 ft. 9 in., in four Compartments, with Manholes, Water-Supply Pipes, and 6-inch Gas Connections. All in good condition. Suitable for a Gas-Works making 12 millions a Year and under.
For Particulars, apply to the MANAGER, Gas-Works, Whittington, near Chesterfield.

YEADON GAS COMPANY

FOR SALE — Two second-hand Gas- HOLDERS of about 60,000 and 36,000 cubic feet capacity, with Columns and Guide-Framing complete. Can be seen at the Yeadon Gas-Works. Contractor must cut out and remove at his own risk.
Offers for one or both to be sent to
EDWARD LISTER,
Secretary and Manager.
Gas Office, Yeadon,
Feb. 28, 1900.

TENDERS FOR GAS COAL.

THE Corporation Gas Committee of Stoke-upon-Trent invite TENDERS for the supply of GAS COAL.
Specification and Form of Tender may be obtained on application to the undersigned, or at the Gas Offices.
Tenders to be sent in not later than Twelve o'clock noon, the 15th of March, 1900, addressed to the Chairman, F. Geen, Esq., J.P., Stoke-upon-Trent, and endorsed "Tender for Gas Coal."
WM. PRINCE,
Engineer and Manager.
Gas-Works, Stoke-upon-Trent.

STOKE-UPON-TRENT CORPORATION GAS-WORKS.

TENDERS FOR TAR AND LIQUOR.

THE Gas Committee are prepared to receive TENDERS for the purchase of the SURPLUS TAR and the whole of the AMMONIACAL LIQUOR made at their Gas-Works from the 1st of April next to the 31st of March, 1901.
Any further Information may be obtained at the Gas-Works.
Sealed Tenders, addressed to the Chairman, F. Geen, Esq., J.P., and endorsed "Tender for Tar and Liquor," to be delivered not later than March 15, 1900.
WM. PRINCE,
Engineer and Manager.

NELSON CORPORATION.
(GAS DEPARTMENT.)

TENDERS FOR ENGINE AND EXHAUSTER.

THE Gas Committee invite Tenders for the supply and erection of an ENGINE and EXHAUSTER at their Brierfield Works.
Full Particulars may be obtained on application to Mr. A. Allan, Gas Engineer, Nelson.
Sealed Tenders, marked "Tender for Engine and Exhauster," to be sent to me, the undersigned, on or before the 13th of March, 1900.
R. M. PRESCOTT,
Town Clerk.
Town Hall, Nelson,
Feb. 28, 1900.

BOROUGH OF BRIGHOUSE.

THE Town Council are prepared to receive TENDERS for the supply of the following Stores—viz., IRONMONGERY, OIL, PAINTS, &c., WROUGHT-IRON TUBES and FITTINGS, and BRUSHES required by the Gas Committee during the Year ending March 31, 1901.

Specifications and Form of Tender can be obtained on application at the Gas Engineer's Office, Mill Lane Works, Brighouse.

Sealed Tenders are to be sent in on or before Friday, the 9th day of March, 1900, addressed to the Town Clerk, Public Offices, Brighouse.

The lowest or any Tender not necessarily accepted.

By order,
JAMES PARKINSON,
Town Clerk.

Public Offices, Brighouse,
Feb. 26, 1900.

RAMSGATE CORPORATION.
(GAS AND WATER DEPARTMENT.)

THE Committee invite Tenders for the supply of about 800 Feet of Stourbridge, or other approved quality, FIRE-CLAY RETORTS, 22 in. by 16 in., 200,000 FIRE-BRICKS and TILES, and 50 Tons of CLAY.

Tenders to be sent in on before or Ten a.m. on Monday, March 19, addressed to the Chairman of the Gas and Water Accounts Committee, Boundary Road, Ramsgate, and endorsed "Tender for Fire-Clay Goods."

The Committee do not bind themselves to accept the lowest or any Tender.

Specification and full Particulars on application to
WILLIAM A. VALON,
Engineer.

BOROUGH OF DARWEN.

TENDERS FOR CANNEL COAL.

THE Corporation are prepared to receive TENDERS for the supply of CANNEL COAL, for One, Two, or Three Years, to be delivered at the Gas-Works Siding in the Corporation Waggons.

Forms of Tender and all Information as to quantities may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Cannel Coal," must be delivered to the undersigned at or before Noon, on Thursday, the 22nd day of March, 1900.

No Tender necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office, Darwen,
March 2, 1900.

CORPORATION OF LEICESTER.

IRON ROOFING.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and erection of two ROOFS, each about 144 feet long and 58 feet and 38 feet span respectively, at their Aylestone Road Works.

Drawings may be seen, and Specifications and Form of Tender obtained, upon application to the Engineer, and on payment of the sum of £10, which amount will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Roofs," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, March 10.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Feb. 24, 1900.

CORPORATION OF LEICESTER.

LANCASHIRE BOILERS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and erection, on Foundations provided, of three LANCASHIRE BOILERS, 30 ft. by 8 ft. 6 in., at their Aylestone Road Works.

Specification and Form of Tender may be obtained upon application to the Engineer, and on payment of the sum of £5, which amount will be returned upon receipt of a *bonâ-fide* Tender.

Tenders, addressed to Alderman Lennard, J.P., Chairman, and endorsed "Tender for Boilers," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, March 10.

The Committee do not bind themselves to accept the lowest or any Tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Feb. 24, 1900.

LYTHAM URBAN DISTRICT COUNCIL.

THE Gas Committee are prepared to receive TENDERS for the work and materials required in the conversion of a SINGLE-LIFT GASHOLDER, 80 feet diameter and 28 feet deep, into a TWO-LIFT Telescopic Gasholder.

The Specification and Drawings may be seen on application to the undersigned, and at the Offices of Messrs. Thomas Newbigging and Son, Engineers, 5, Norfolk Street, Manchester; and copies of the Bill of Quantities and Form of Tender may be obtained from the latter on payment of Two Guineas, which will be returned on receipt of a *bonâ-fide* Tender.

Sealed Tenders, endorsed "Contract No. 1 Gasholder," to be addressed to the Chairman, Gas Committee, Lytham, and sent so as to reach me not later than noon on Tuesday, the 13th day of March, 1900.

The Committee do not bind themselves to accept the lowest or any Tender.

CHAS. A. MYERS,
Clerk.

District Council Offices, Lytham,
March 1, 1900.

SOUTHPORT CORPORATION GAS-WORKS.

THE Gas Committee invite Tenders for the supply of GAS OIL for the Manufacture of Gas.

Specification and Particulars may be obtained on application to the undersigned, to whom Tenders must be sent not later than Monday, March 19, 1900.

JOHN BOOTH,
Engineer.

Southport, Feb. 26, 1900.

AYR GAS COMPANY, LIMITED.

THE Directors invite Tenders for the supply during the Year from the 31st of March of 7000 Tons of SECOND CLASS CANNEL COAL and 2000 Tons of GAS SPLINT COAL, free on rail at Ayr Railway Station.

Sealed Tenders, marked "Tender for Coal," and giving Name, Analysis, and Quantity of Coal offered, to be lodged with the Subscriber not later than the 15th of March.

WILLIAM J. POLLOCK,
Secretary.

24, Sandgate, Ayr,
Feb. 27, 1900.

URBAN DISTRICT COUNCIL OF PADIHAM.

TAR AND AMMONIACAL LIQUOR.

THE Gas Committee of the above Council invite TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR, to be produced at their Gas-Works during the Year ending March 31, 1901.

Sealed Tenders, addressed to the Chairman, Gas Committee, must be sent to me, not later than Monday, March 19, 1900; and for Particulars apply to the undersigned.

J. R. SMITH,
Clerk to the Council.

Padiham, March 1, 1900.

DRIGHLINGTON AND GILDERSOME GASLIGHT COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for the supply and erection of the undermentioned work—

1. BRICK RETORT-HOUSE, 122 ft. by 45 ft., and 25 ft. high to Eaves.
2. WROUGHT-IRON ROOF for above Retort-House.
3. RETORT-BENCH, to contain 48 ⏢ Retorts, 22 in. by 16 in., on the Shallow Regenerative System.
4. IRONWORK and RETORT-FITTINGS required for above Retort-Bench.

The Directors do not bind themselves to accept the lowest or any Tender; and further Particulars can be had on application to the undersigned.

J. WILKINSON,
Secretary and Manager.

Gas-Works, Drighlington,
Feb. 26, 1900.

MANCHESTER CORPORATION GAS-WORKS.

TO OIL IMPORTERS AND OTHERS.

THE Gas Committee of the Corporation of Manchester are prepared to receive TENDERS for the supply of 20.000 Tons of OIL suitable for the Manufacture of Carburetted Water Gas.

The Oil to have a Flashing-Point of not less than 73° (Abel's Test), and not less than any higher degree of temperature which may be specified in any future Act of Parliament, or Regulations to be made there under.

Full Description, with Analysis of the Oil offered, must be submitted with each Tender, as well as a sealed sample of the same.

The Oil to be delivered free of all charges (including Ship Canal dues) into the Storage Tanks of the Corporation at Trafford Wharf on the Banks of the Manchester Ship Canal, in such quantities as may be from time to time required by the Gas Committee, during the period of Two Years ending on the 31st of March, 1902.

Tenders to be at a price per Imperial Gallon.

Further Particulars may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent of the Gas Department.

Sealed Tenders and Samples, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Gas Oil," must be delivered at the Office of the Superintendent of the Gas Department, Town Hall, Manchester, on or before Monday, the 26th day of March next.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order of the Gas Committee,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Feb. 16, 1900.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

SALE BY TENDER OF £15,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

IN pursuance of the Tottenham and Edmonton Gas Act, 1898, Notice is Hereby Given that it is the intention of the Directors of this Company to Sell by Tender £15,000 FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, to be paid up in full on or before the 30th day of April next; such Stock being a portion of Additional Capital authorized to be raised by Resolution passed at an Extraordinary General Meeting of Proprietors held on the 24th day of February, 1900, under the powers of the above-mentioned Act.

Particulars, Conditions, and Form of Tender may be obtained on application at this Office; and Sealed Tenders must be sent in not later than Four o'clock in the afternoon on Tuesday, the 10th day of April next.

By order of the Directors,
JAMES RANDALL,
Secretary.

Offices of the Company:
Wilioughby Lane, Tottenham,
March 2, 1900.

BRITISH GASLIGHT COMPANY, LIMITED.

NOTICE is Hereby Given, that the HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at this Office on Wednesday, the 21st inst., at Half-past Twelve o'clock precisely, to transact the usual Business, and to declare the Dividend for the Half Year ended the 31st of December last.

Notice is Hereby also Given, that the TRANSFER BOOKS of the Company WILL BE CLOSED on the 10th and RE-OPENED on the 22nd inst.

By order of the Court of Directors,
H. B. CHAMBERLAIN,
Secretary.

Chief Office: No. 11, George Yard,
Lombard Street, London, E.C.,
March 2, 1900.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by AUCTION of GAS and WATER STOCKS and SHARES under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
PLYMOUTH AND STONEHOUSE GAS COMPANY.

NEW ISSUE OF £4000 ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 20, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
SOUTHEND WATER-WORKS COMPANY.

£4500 FOUR PER CENT. PERPETUAL DEBENTURE STOCK.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, March 20, at Two, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
BRIGHTON AND HOVE GENERAL GAS COMPANY.

£10,000 FOUR PER CENT. PREFERENCE STOCK,

Offering to Trustees and others an Investment of the soundest character.

MR. ALFRED RICHARDS will Sell THE ABOVE BY AUCTION, at the Mart, E.C., on Wednesday, March 28, at Two o'clock, in Lots.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

WEST MIDDLESEX WATER-WORKS COMPANY.

ISSUE OF £100,000 THREE POUNDS PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue, being a further portion of the £440,000 DEBENTURE STOCK created under the West Middlesex Water-Works Act, 1894, bearing Interest at £3 per cent. per annum, and redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Tenders must be delivered at the Company's Office, No. 19, Marylebone Road, N.W., not later than Eleven a.m. on Tuesday, the 20th of March next.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Office, or will be forwarded on application.

By order of the Board of Directors,
F. H. WYBROO,
Chief Clerk and Secretary.

No. 19, Marylebone Road, N.W.,
Feb. 29, 1900.

By order of the Directors of the
CROYDON COMMERCIAL GAS AND COKE COMPANY.

SALE OF £5000 CONSOLIDATED "B" ORDINARY STOCK, AND £2500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

MESSRS. HOOKER & WEBB have received instructions to SELL BY AUCTION, at the Greyhound Hotel, Croydon, on Thursday, March 15, at Five o'clock precisely, in 85 Lots,

£5000 CONSOLIDATED "B" ORDINARY STOCK, AND £2500 FIVE PER CENT. PERPETUAL DEBENTURE STOCK

of the Croydon Commercial Gas and Coke Company. The Dividend paid on the "B" Stock for some years has been at the rate of £11 per cent. per annum. The Sale therefore offers an unusually good opportunity for absolutely safe investment in a first-class security.

The Stock will be divided into Lots of £100 and £50 each for the convenience of purchasers.

Particulars and conditions of Sale may be obtained of Mr. W. J. RUSSELL, the Secretary, at the Offices of the Company, Katherine Street, CROYDON; of Messrs. BLYTH, DUTTON, HARTLEY, and BLYTH, Solicitors, 112, Gresham House, LONDON, E.C.; and of the AUCTIONEERS, 4, High Street, CROYDON.

BRENTFORD GAS COMPANY.

NOTICE.

THE Directors of the Brentford Gas Company, having reconsidered the proposed issue of FOUR PER CENT. PERPETUAL DEBENTURE STOCK of the Company, find it expedient to CANCEL and WITHDRAW the PARTICULARS and CONDITIONS OF SALE BY TENDER of such DEBENTURE STOCK.

Any persons who have already sent in Tenders for such Debenture Stock are hereby requested to apply for the return of their Deposits.

By order,
WILLIAM MANN,
Secretary.

Office, Brentford,
Feb. 23, 1900.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

SALE OF 3½ PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that the Directors have instructed Mr. ROBERT MACK, Auctioneer, to SELL BY AUCTION at the Offices of the Company, Grainger Street West, Newcastle-upon-Tyne, on Wednesday, the 28th of March, 1900, at Twelve o'clock noon, £13,000 of the NEWCASTLE-UPON-TYNE and GATESHEAD GAS DEBENTURE STOCK (perpetual), bearing Interest at the rate of £3 10s. per cent. per annum.

For Conditions of Sale and further Particulars, apply to the undersigned.

(Signed) THOS. WADDOM,
Secretary.

Feb. 28, 1900.

NEWCASTLE AND GATESHEAD WATER COMPANY.

TO be Sold by Auction, in the Board-Room of the Company's Offices, Pilgrim Street, Newcastle-on-Tyne, on Tuesday, the 20th of March, 1900, at Half-past Twelve o'clock precisely, by Mr. CHARLES A. JOEL, in such Lots as are provided for in the said Company's Act of 1894—

FORTY THOUSAND POUNDS OF FIVE PER CENT. PREFERENCE STOCK (1894).

Printed Particulars and Conditions of Sale may be had at the Company's Offices; and Messrs. George Armstrong and Sons, Solicitors, Newcastle-on-Tyne; or of the Auctioneer, 66, New Bridge Street, Newcastle-on-Tyne.

GEORGE SMITH,
Secretary.

Newcastle-on-Tyne,
Feb. 7, 1900.

Just Published, Price 1s. 1d., *post free, in Khaki Cover.*

PERSONAL EXPERIENCES IN SOUTH AFRICA,

WITH

SOME REFLECTIONS APPROPRIATE TO THE OCCASION.

By THOMAS NEWBIGGING.

MANCHESTER: R. S. CHRYSTAL, Market Street.
LONDON: GAY & BIRD, Bedford Street, Strand.

The Proceeds to be given to the War Fund.

GAS PLANT New or 2nd Hand Equipments for Coal Gas, Water Gas, Oil, Acetylene, Coke Oven, and Blast Furnace Gas.

POWER or LIGHT WORKS.

Also **VALUATION** Consultation, Inspection, & Expert Reports.

JAS. WRIGHT, M.I.M.E. BRIDGE HOUSE, BLACKFRIARS, E.C.

COKE-BREAKERS,

PRICES REDUCED.

(THOMAS & SOMERVILLE'S PATENT)

With Elevators and Conveyors worked by Steam or Gas Engine.

GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.;
And at STROUD, GLOUCESTERSHIRE.

NEWBATTLE CANNEL.

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LONDONDERRY GAS COALS

FROM THE

LONDONDERRY COLLIERIES,

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Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
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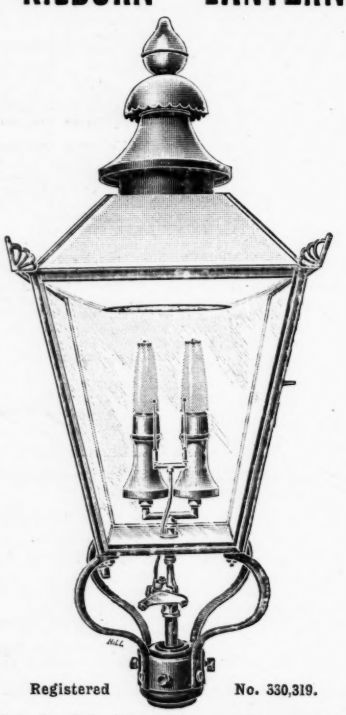

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Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts and Covers, and rendering Leakage impossible.

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ANALYSIS.

Yield of Gas per Ton. .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

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OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
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Yield of Gas per Ton . .	10,500	Cub. Ft.
Illuminating Power . . .	16·9	Candles.
Coke (of good quality) . .	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
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INFRINGEMENT OF COPYRIGHT "GAS FIXTURES."

MESSRS. JAMES MILNE & SON, LTD., DIRECT THE ATTENTION OF MANUFACTURERS AND BUYERS OF GAS-FITTINGS TO A MEMORANDUM IN THE UNDER-NOTED TERMS WHICH HAS, AT THEIR DEMAND, BEEN HANDED TO THEM BY MESSRS. JOHNSTON PARK & CO., WHO BEAR THE EXPENSE OF THIS ANNOUNCEMENT.

15, Oswald Street, GLASGOW,
February 15th, 1900.

Johnston Park & Co., Gas-Fitting Manufacturers, Glasgow, having published a Catalogue entitled "Gas-Fixtures," in which use has, by inadvertence, been made of designs from the Gas-Fixtures Catalogue of James Milne & Son, Limited, Gas Engineers, Edinburgh, London, Glasgow, & Leeds, on representation made by James Milne & Son, Ltd., have expressed their regret, and called in and destroyed the whole issue.

(Signed) JOHNSTON PARK & CO.

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LIMITED,
Milton House Works, EDINBURGH.
And at LONDON, GLASGOW, LEEDS.

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time was held exclusively by Great ... but at present a great deal is imported from ... America.
The Evason Coal & Coke Company, Ltd., of 184, Edmund Street, Birmingham, claim to have promptly fulfilled all their Contracts during this trying winter, and they have still "Spot" lots of Gas-Coal and Cannel for quick delivery.
Wire Netting and Rope.—These goods are extensively used in the mining districts, especially brass ... which is all imported from the ... are extensively used ...

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,
SUPPLY FROM STOCK
CAST-IRON RETORTS
AND ALL KINDS OF GAS-WORKS APPARATUS.
SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of LYON'S "PATENT" GAS-MAIN SYPHONS.
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Manufacturer of
Bellows for Inflating Gas-Bags. Made in various sizes.

Bellows made to inflate a 48-inch Bag under One Minute.

India-rubber Hose, Sheet, and Washers of every description, Leather Bands, Oils, &c., Diving and Wading Dresses, Waterproof Coats, Capes, and Sewer Boots.
Stokers' Mitts, from 14s. doz.
Special Air Tubing made for Gas Companies.

Miners' Woollen Jackets.
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71, GOSWELL ROAD, E.C., AND AT
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PETTIGREW'S PATENT
Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM
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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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SHEAF WORKS, SHEFFIELD,
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SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS, ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.
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HOLMSIDE
GAS COALS.
Present Daily Produce over 5000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
Tar . . . . . $16\frac{3}{4}$ lbs. (Avoir.) per Ton.
Ammoniacal Liquor 103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR
PELTON GAS COALS.
Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.
Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.
These Coals may be bought through the Principal Merchants in England, or direct from

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HOLMSIDE & SOUTH MOOR OFFICES,
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NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

DISPENSE WITH CANNEL COAL
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INCREASE YOUR ILLUMINATING POWER
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WHESSOE-MUNICH BENZOL CARBURETTER
The Cheapest and Best in the Market.
The Managers of Tynemouth, Middlesbrough, and Darlington Gas-Works are much pleased with it, and would not be without it.
Apply to the Sole Makers:
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"MALL" LANTERN
Absolutely the STRONGEST and CHEAPEST Lantern in the Market.

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TYNE
BOGHEAD CANNEL.
Yield of Gas per ton . . . . . 13,155 cub. ft.
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Coke per ton . . . . . 1,301·88 lbs.

EAST PONTOP GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 17·8 candles.
Coke . . . . . 70 per cent.

SOUTH PELAW MAIN GAS COAL.
Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·3 candles.
Coke . . . . . 73·1 per cent.

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The Welsbach Company are advised that **THESE MANTLES ARE ALSO INFRINGEMENTS** of a later Patent, No. 124 of 1893; and they have brought an Action upon this Patent to enforce their Rights.

USERS ARE EQUALLY LIABLE WITH DEALERS.

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WELSBACH INCANDESCENT GAS-LIGHT CO.,

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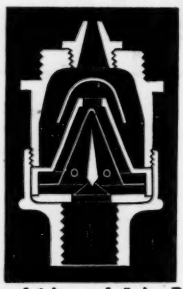
SPECIAL GOVERNOR FOR INCANDESCENT LIGHTING.

Top of GOVERNOR SCREWS Direct into Tube of BURNER, and is tapped to receive Incandescent Company's Nipple.

Stem Rubber for Tube.

Requires only $\frac{3}{10}$ths higher pressure than is necessary to pass the Gas through Nipple without a Governor.



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Most Satisfactory and RELIABLE GOVERNOR on the Market.

Hexagon Tapped $\frac{3}{8}$ in. and $\frac{1}{2}$ in. Iron.

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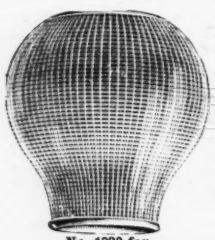

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The Globes are now MUCH LIGHTER in weight, MORE ARTISTIC in design, and MORE EFFICIENT in light control. An entirely new Series of Patterns. Send post-card for new Catalogue to

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ALBION IRON-WORKS, MILES PLATTING, MANCHESTER;

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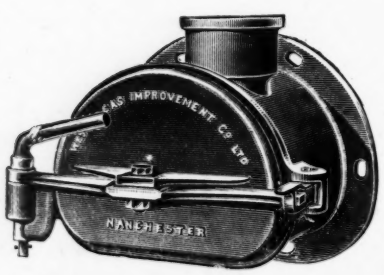

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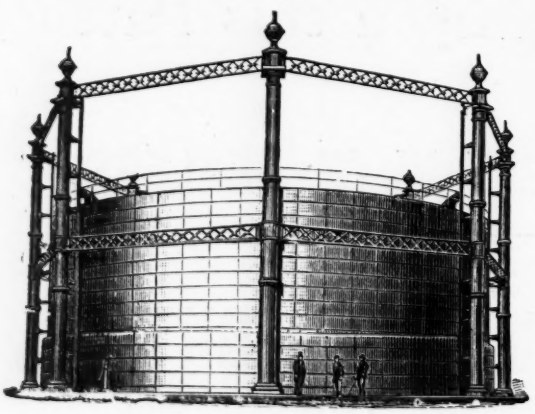

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References to 600 Works already erected.

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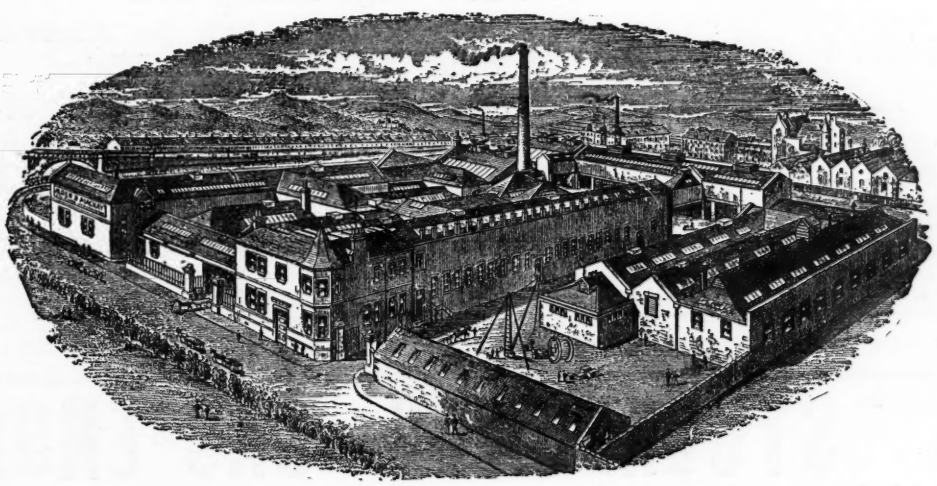

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Dry Meters in Cast-Iron Cases.

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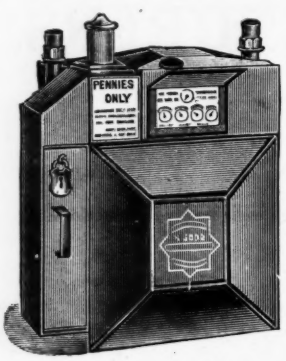

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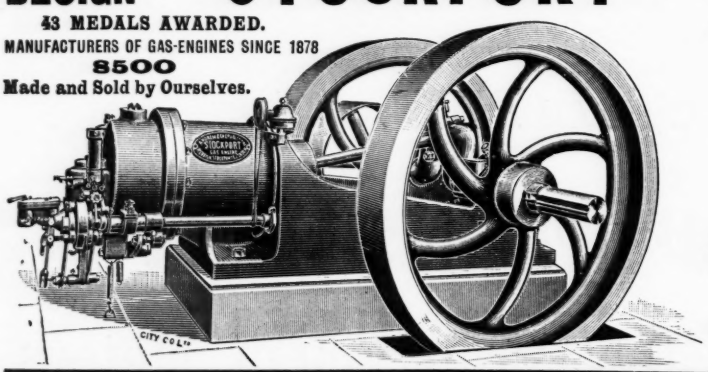
MANUFACTURERS OF GAS-ENGINES SINCE 1878
8500
Made and Sold by Ourselves.



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DEPÔTS IN ALL THE PRINCIPAL TOWNS.

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FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.
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THE PIONEERS

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WITHOUT CHIMNEYS.

The "SMALL TORCH" Burner (Bandsept Patent) for Street Lighting, consuming 3½ feet of Gas per hour. Having an efficiency of 25-Candle Power per Cubic Foot of Gas consumed, it is not only the BEST but CHEAPEST Intensive CHIMNEYLESS Burner on the Market.

PRICE COMPLETE WITH MANTLE

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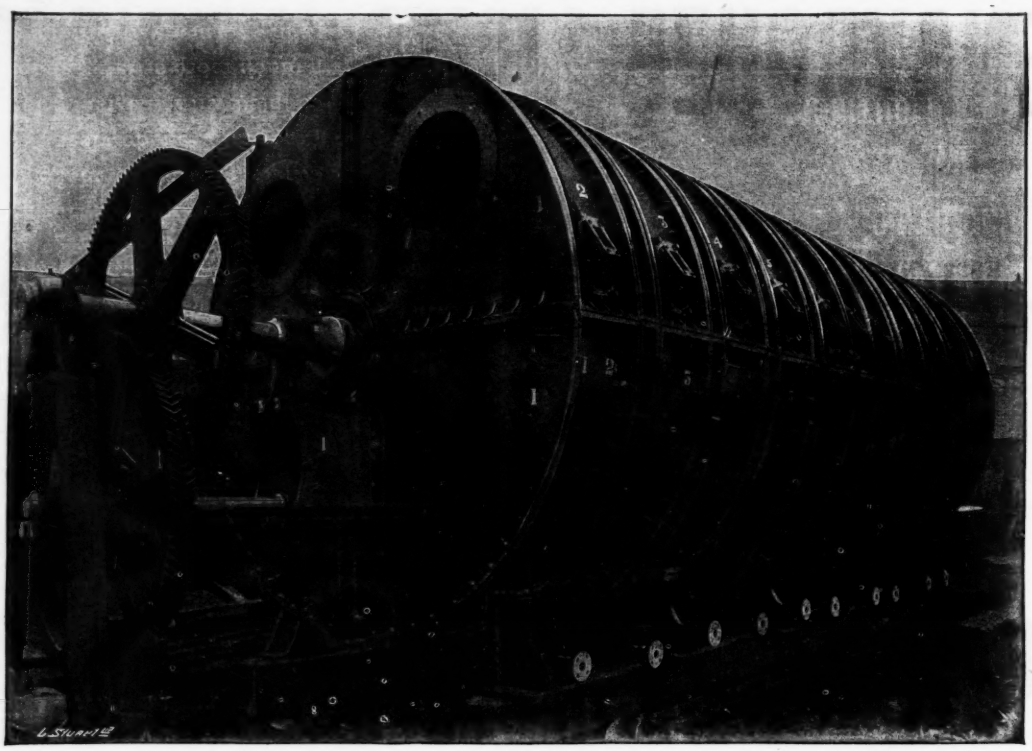
All other Burners supplied by the Syndicate proportionately Reduced, full Particulars of which will shortly be issued to the Trade, and followed by new and complete Catalogue.

PATENT "NEW" SCRUBBER-WASHER

RESULTS GUARANTEED.



RESULTS GUARANTEED.

Photo. of Machine recently erected at Gaythorn Gas-Works, Manchester.

NOTE: Orders already received in **1900** for MACHINES to deal with **23,500,000** cubic feet of Gas per Diem.

[*Extract from Paper by* Mr. T. N. RITSON, Assoc.M.Inst.C.E., of Kendal, *read before the* MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS, *June* 3, 1899.]

"A HOLMES' PATENT ROTARY 'NEW' WASHER-SCRUBBER was erected in the autumn of 1895, and is capable of dealing with half-a-million cubic feet of gas per day. This washer completely purifies the gas from ammonia, with from 10 to 12 gallons of water per ton of coal carbonized, leaving only 0·3 to 0·5 grain of ammonia per 100 cubic feet of gas at the outlet. Since this machine was erected, THE YIELD OF SULPHATE OF AMMONIA HAS BEEN MORE THAN DOUBLED."—"Journal of Gas Lighting," *June* 6, 1899.

[EXTRACT FROM ENGINEER'S LETTER.]

"I have pleasure in stating, that the Machine which you erected for me has MORE THAN FULFILLED YOUR PROMISE in every respect. Not only was the strength of the liquor obtained improved, and the outlet gas RENDERED NEUTRAL TO LITMUS PAPER, but the illuminating power was so much better than under the former conditions of Scrubbing, that the required standard of light was maintained, at a reduced average cost per ton of coal carbonized, equal to 7 per cent. I may add, that these particulars were confirmed by an Edinburgh Analyst, who tested the gas before and after the installation of your Scrubber-Washer."

W. B. McLUSKY, President W.A.G.E.

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12,000 PUMPS IN STOCK AND PROGRESS.

TRADE MARK.

NO TAPPETS.

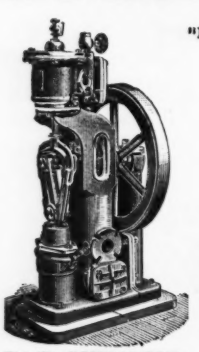

Fig. 705. "SINGLE RAM" STEAM-PUMP.

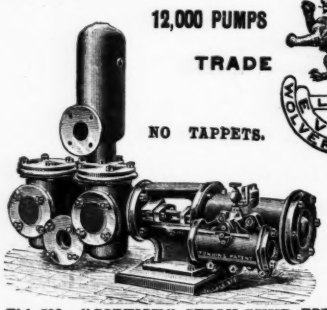

Fig. 598. "CORNISH" STEAM-PUMP FOR BOILER FEEDING, &c.

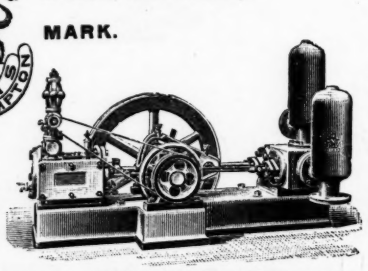

Fig. 685. "RELIABLE" STEAM-PUMP FOR TAR AND THICK FLUIDS.

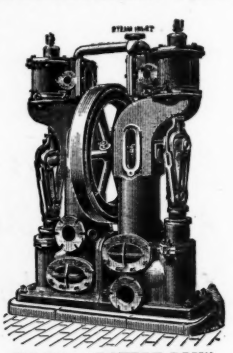

Fig. 712. "DOUBLE-RAM" STEAM-PUMP.

NEW SUNLIGHT INCANDESCENT CO., LTD.

33-34, SHOE LANE, LONDON, E.C.

THE

"SIMPLEX" CHIMNEYLESS BURNER

Manufactured under the De Mare MASTER Patent and subsequent Minor Patents.

SEE CAUTION BELOW.

IN THREE SIZES, as follows—

No. 2.
COTTAGE SIZE.

No. 3.
FOR SHOP AND INTERIOR LIGHTING.

No. 4.
STREET LIGHTING.

With SUNLIGHT WHITE MANTLE.

The "Simplex" is fitted with a Removable Cap and an Air-Adjusting Ring, making it quite easy for anyone to adapt the Burner to the very varying Pressures and Qualities of Gas in different parts of the country.

The "Simplex" Burner is so constructed as to make the light practically shadowless; and this, coupled with the fact that it is of a much more artistic shape, gives it an enormous advantage over the very unsightly competing infringement for the moment on the market.

Maximum Light (without artificial pressure) 125 Candle Power.

CAUTION! CAUTION!! CAUTION!!!

INCANDESCENT GAS LIGHTING.

All Dealers and the Public are CAUTIONED against Buying, Selling, or Using "NEW WELSBACH" (commonly known as the "KERN") BURNERS.

ACTIONS FOR INFRINGEMENT OF PATENT HAVE BEEN COMMENCED by the NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED, against the WELSBACH COMPANY for Infringement of the DE MARE PATENT by the MANUFACTURE AND SALE of such Burners, and are about to be commenced against Dealers and Users for Infringement of our Patent in respect of their Sale or Use. USERS are equally liable with DEALERS.

NEW SUNLIGHT INCANDESCENT CO., LTD.

33-34, SHOE LANE, LONDON, E.C.

ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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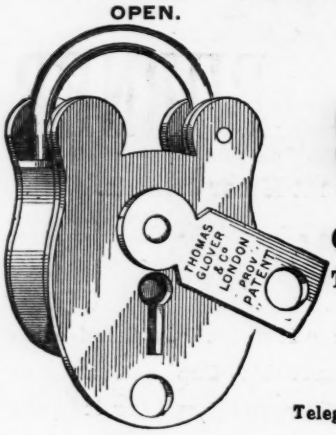

THOMAS GLOVER & CO.'S

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PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

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BRISTOL: 28, BATH STREET. *Telegraphic Address: "GOTHIC."* **Telephone No. 1905.**

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

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GLASGOW: 69-71, McALPINE STREET. *Telegraphic Address: "GASMAIN."* **Telephone No. 6107.**

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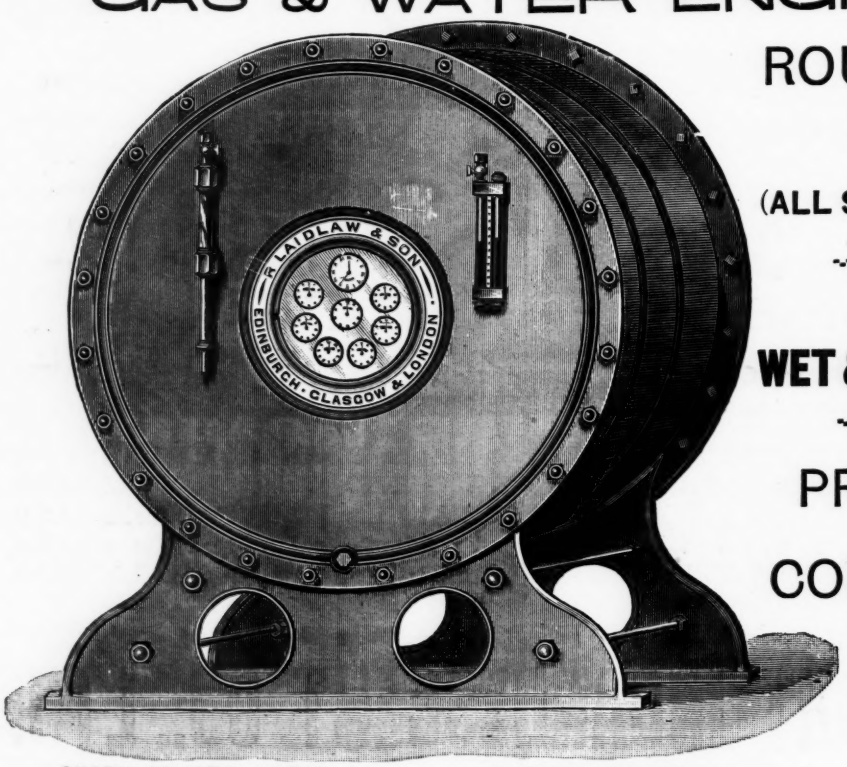

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PREPAYMENT AND COMPENSATING METERS.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

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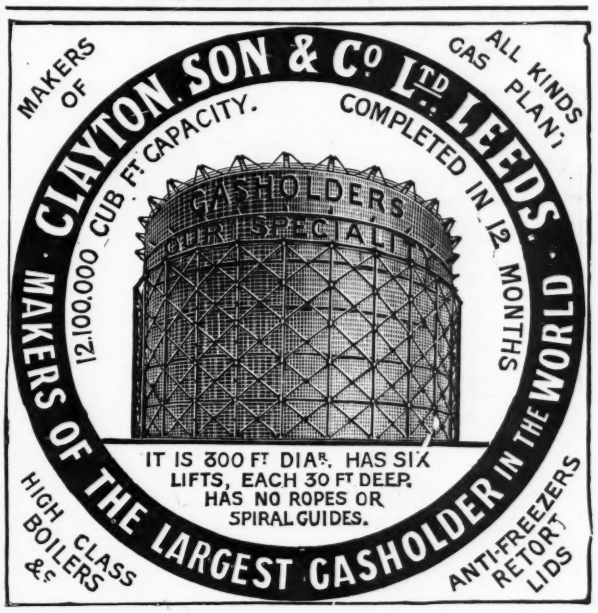
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INTERESTING EXTRACT FROM AN ENGINEER'S LETTER.

RECEIVED JAN. 25, 1900.

"During the Summer this town was visited by a severe typhoon **LASTING THREE DAYS.** The peculiarity of our typhoon is the wind seems to come in **TREMENDOUS GUSTS** from varying directions. This, of course, tests the stability of any structure; and you will therefore be glad to hear that your **SPIRAL-GUIDED GASHOLDER** stood the trial admirably. Our Gasholders with Columns and Girders were oscillating over 4 inches; but although the spiral was inflated well up in the second lift, there was **NO VISIBLE MOVEMENT.** This is extremely gratifying to me after advising my Directors to adopt your type. Please let me know **IF YOU CAN INCREASE THE STORAGE OF MY OTHER GASHOLDERS ON THIS SYSTEM** by adding additional Lifts."

Any further Information required should be obtained from

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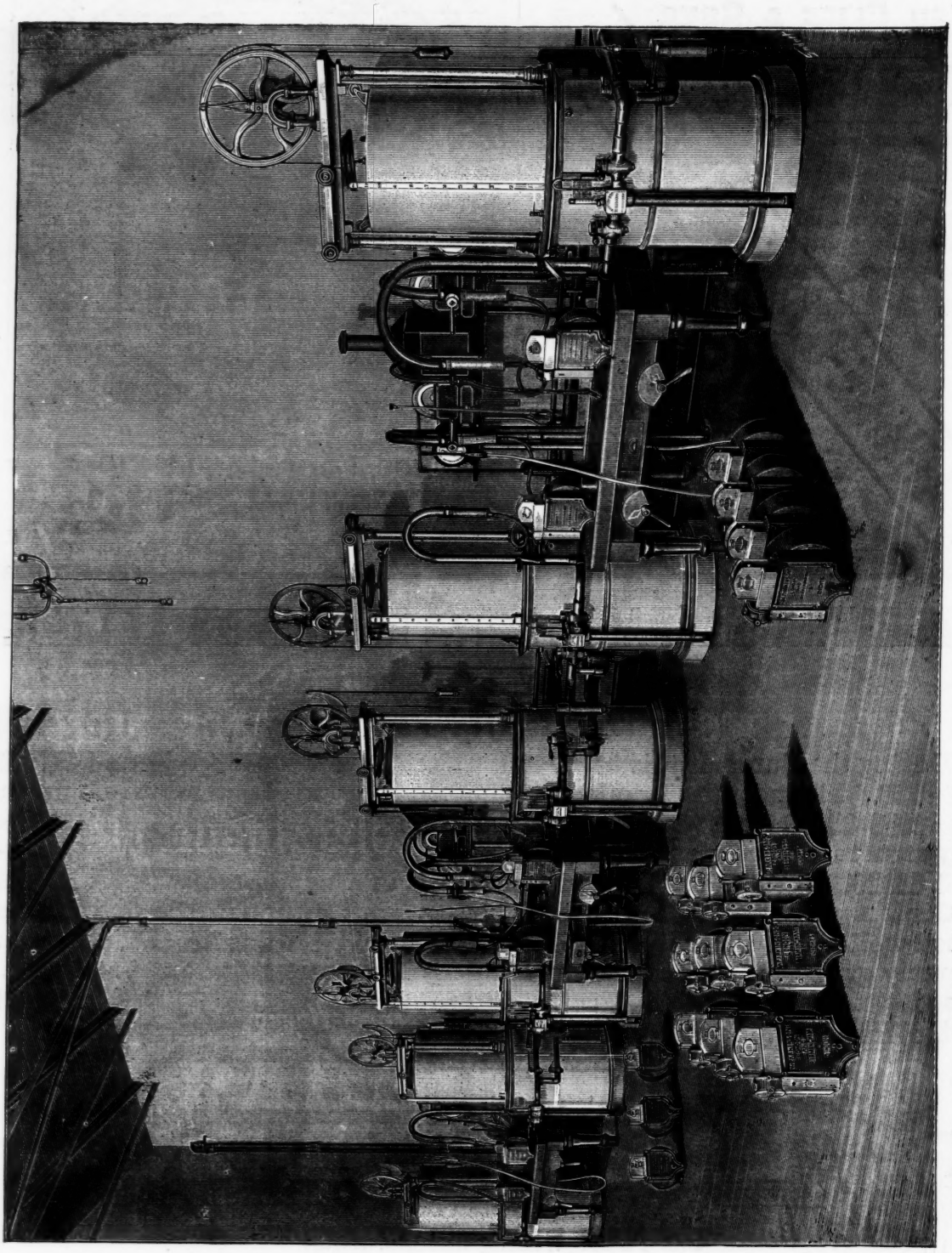

VIEW OF THE BIRMINGHAM CORPORATION GAS-METER TESTING-STATION, AT SHEEP STREET, BIRMINGHAM.
ALL THE APPARATUS SUPPLIED AND FITTED BY W. PARKINSON & CO.

COTTAGE LANE WORKS, CITY ROAD,
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Telegrams: "INDEX." Telephone No. 778 King's Cross.

BELL BARN ROAD WORKS,
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Telegrams: "GASMETERS." Telephone No. 1101.

[See also Advt. p. 592

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